Instruction Manual
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Micro Motion®
Net Oil Computer Software and NOC System

Configuration and Use Manual

Micro Motion®

EMERSON™
Process Management

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Contents

Chapter 1 Before You Begin 1

1.1 Overview 1
1.2 Safety 1
1.3 About the Net Oil Computer Software and the NOC system 1
1.3.1 NOC system components 1
1.3.2 Communication tools 2
1.4 Documentation resources 2
1.5 Configuration overview 3
1.6 Using and maintaining the NOC system 3
1.7 Customer service 4

Chapter 2 NOC System Overview 5

2.1 Overview 5
2.2 Terminology 5
2.3 Internal structure of the Net Oil Computer Software 7
2.4 Sensor input to the Net Oil Computer Software 7
2.4.1 Mapping NOC Meters to MMI sensors 9
2.4.2 Water leg measurement versus liquid leg measurement 10
2.5 Operation modes 11
2.6 Required well data 11
2.7 Water cut determination 12
2.8 Temperature correction 12
2.9 Pressure correction 12
2.10 Pressure compensation 13
2.11 Transient bubble remediation (TBR) 13
2.11.1 Correct Density option 14
2.12 Using NOC data 15
2.13 Using the Recalculation feature 16
2.14 Using event and alarm data 16
2.15 Planning the configuration 17

Chapter 3 Setting Up the ROC809 Platform 19

3.1 About this chapter 19
3.2 Configuring the ROC809 platform 19
3.3 Verifying the Net Oil Computer Software 20
3.4 Verifying the startup configuration file 20

Chapter 4 Net Oil Computer Software Displays 23

4.1 About this chapter 23
4.2 NOC Station display 23
4.2.1 NOC Station display – General panel 23
4.2.2 NOC Station display – Units panel 26
4.2.3 NOC Station display – Totals panel 27
4.2.4 NOC Station display – Averages panel 29
4.2.5 NOC Station display – Well Selection panel 31
4.2.6 NOC Station display – Alarms panel 32
4.3 MMI Interface display 32
4.3.1 MMI Interface display – Comm Setup panel 33
4.3.2 MMI Interface display – Registers panel 34
4.3.3 MMI Interface display – Alarms panel 35
4.3.4 MMI Interface display – Pressure Compensation panel 36
4.4 NOC Meter display 37
4.4.1 NOC Meter display – General panel 37
4.4.2 NOC Meter display – Inputs panel 38
4.4.3 NOC Meter display – TBR panel 40
4.4.4 NOC Meter display – Instant Values panel 41
4.4.5 NOC Meter display – Totals panel 43
4.4.6 NOC Meter display – Averages panel 45
4.4.7 NOC Meter display – Alarms panel 46
4.4.8 NOC Meter display – Density Determination panel 48
4.5 Well Data display 50
4.5.1 Well Data display – Configuration panel 50
4.5.2 Well Data display – History panel 51
4.6 NOC Recalc display 54
4.6.1 NOC Recalc display – General panel 54
4.6.2 NOC Recalc display – Totals panel 55
4.6.3 NOC Recalc display – Averages panel 57
4.6.4 NOC Recalc display – Recalculable Tests panel 58

Chapter 5 Configuring the NOC System 61

5.1 About this chapter 61
5.2 General procedure 61
5.3 Configuring the NOC Station 62
5.4 Configuring the wells 63
5.5 Configuring the MMI Interface(s) 63
5.6 Configuring an NOC Meter 64

Chapter 6 Special Topics in Configuration 67

6.1 About this chapter 67
6.2 Setting up gas measurement 67
6.3 Configuring water cut measurement using water cut probes (WCPs) 69

Chapter 7 Density Determination Routines 71

7.1 About this chapter 71
7.2 About the density determination routines 71
7.3 Preparing for density determination 71
7.4 Density determination for oil 72
7.5 Density determination for water 72

Chapter 8 Using the NOC System 75

8.1 About this chapter 75
8.2 Operation mode 75
8.2.1 Changing operation mode 75
8.2.2 Managing well tags when changing modes 76
8.3 Using Continuous mode 76
8.3.1 Starting Continuous mode measurement 76
8.3.2 Using Force End of Day 77
8.3.3 Changing parameters during Continuous mode measurement 77
8.3.4 Viewing Continuous mode current data 78
8.3.5 Viewing Continuous mode contract period data 78
8.4 Performing a well test 79
8.4.1 Pausing or stopping a well test 79
8.4.2 Changing parameters during a well test 80
8.4.3 Viewing current well test data 80
8.4.4 Viewing stored well tests 80
8.5 Viewing flow and status alarms 80
8.6 Viewing gas data 81
8.7 Using the Recalculation feature 81
8.7.1 For well tests 81
8.7.2 For contract periods 82

Chapter 9 History and Modbus Interface 85

9.1 About this chapter 85
9.2 History on the ROC809 platform 85
9.3 Modbus interface on the ROC809 platform 86
9.3.1 Predefined Modbus register ranges 86

Chapter 10 Maintenance and Troubleshooting 97

10.1 About this chapter 97
10.2 Connecting from ROCLINK 800 to the ROC809 platform 97
10.3 Alarms 98
10.3.1 Status alarms 98
10.4 Checking process variables and test points 99
10.5 Checking slug flow 102
10.6 Checking the characterization 102
10.7 Checking the calibration 102
10.8 Diagnosing wiring problems 103
10.8.1 Checking the power supply wiring 103
10.8.2 Checking the sensor-to-ROC809 wiring 103
10.8.3 Checking grounding 103
10.9 Checking the test points 104
10.9.1 Evaluating the test points 104
10.9.2 Drive gain problems 104
10.9.3 Low pickoff voltage 105
10.10 Checking the core processor 105
10.10.1 Checking the core processor LED 106
10.10.2 Core processor resistance test 106
10.11 Checking sensor coils 107

Appendix A User-Defined Points 111

A.1 About this appendix 111
A.2 NOC Station parameters (UDP 67) 111
A.3 NOC Meter parameters (UDP 68) 115
A.4 Well Data parameters (UDP 69) 120
A.5 NOC Recalculation parameters (UDP 70) 124
A.6 MMI Interface parameters (UDP 71) 129

Index 137

Chapter 1
Before You Begin

1.1 Overview

This chapter provides an orientation to the Micro Motion® Net Oil Computer Software and this manual, including configuration, use, and troubleshooting.

1.2 Safety

Safety messages are provided throughout this manual to protect personnel and equipment. Read each safety message carefully before proceeding to the next step.

1.3 About the Net Oil Computer Software and the NOC system

The Net Oil Computer Software is one component in a net oil measurement system (NOC system) The Net Oil Computer Software is a user program designed to run on the ROC809 Remote Operations Controller from Remote Automation Solutions. The Net Oil Computer Software performs net oil measurements and calculations and provides a variety of real-time, average, summary, and historical net oil data, using functionality provided by the ROC809 platform.

1.3.1 NOC system components

The NOC system includes the following components:

- ROC809 platform
- Net Oil Computer Software
- One to four Micro Motion sensors
  - Up to three Micro Motion sensors may be used for NOC measurement
  - One Micro Motion sensor may be used for gas measurement (optional)

Optional components include:

- Water cut probe(s)
- Pressure sensor, temperature sensor, level sensor, conventional (orifice plate or turbine) gas meter

See the manual entitled *Micro Motion Net Oil Computer Software and NOC System: Installation Manual* for illustrations of several different NOC systems.

1.3.2 Communication tools

During installation, two software programs were installed on the PC for use as communication tools:

- ProLink® II – used to configure the core processor, and also used for some maintenance and troubleshooting functions
- ROCLINK™ 800 from Micro Motion – used to configure the ROC809 controller and the Net Oil Computer Software, and typically also used to operate the NOC system. ROCLINK 800 from MMI is also used for most maintenance and troubleshooting functions

Note: A standard version of ROCLINK 800 is available from Remote Automation Solutions. This software can be used for all ROC809 functions. However, Micro Motion recommends using the version of ROCLINK 800 supplied with the Net Oil Computer Software. Throughout this manual, the term "ROCLINK 800" refers to ROCLINK 800 from Micro Motion. Information specific to the ROC809 platform is provided in the standard ROCLINK 800 manual from Remote Automation Solutions: ROCLINK 800 Configuration Software: User Manual.

If desired, a customer-written Modbus or ROC Plus program may be used to communicate with the ROC809 platform and the Net Oil Computer Software.

1.4 Documentation resources

This manual covers only topics that are specific to the Net Oil Computer Software and the NOC system. General configuration, administration, and troubleshooting of the ROC809 platform is provided in the manual entitled *ROCLINK 800 Configuration Software: User Manual*.

Table 1-1 lists other documentation resources for required or useful information.

Table 1-1 Documentation resources

Topic	Document	Location
Net Oil Computer Software and NOC system installation	*Micro Motion Net Oil Computer Software and NOC System: Installation Manual*	Shipped with Net Oil Computer Software
ROC809 platform configuration and administration	*ROCLINK 800 Configuration Software: User Manual*	Shipped with Net Oil Computer Software
ProLink II installation and use	*ProLink II Software for Micro Motion Transmitters: Installation and Use Manual*	ProLink II CD Installed with product Micro Motion web site
Point (TLP) system Writing host programs using ROC Plus protocol	*ROC Plus Protocol: Specification Manual*	Remote Automation Solutions web site
Using the Modbus host user program	*Modbus Host User Program Manual*	Remote Automation Solutions web site

1.5 Configuration overview

To configure the NOC system:

1. Review the information about system and configuration options in Chapter 2, and collect the information required for your NOC system.
2. Prepare the ROC809 platform as described in Chapter 3.
3. Referring to Chapter 4 for detailed parameter definitions, configure the Net Oil Computer Software as described in Chapter 5.
4. If your NOC system includes gas measurement, configure gas measurement as described in Chapter 6.
5. If your NOC system uses water cut probes, configure water cut measurement as described in Chapter 6.
6. If required for well configuration, perform density determination as described in Chapter 7.

To write a Modbus or ROC Plus program to communicate with the Net Oil Computer Software, see the information in Chapter 9 and Appendix A.

1.6 Using and maintaining the NOC system

To use the NOC system:

1. Review the information about system and configuration options in Chapter 2.
2. Follow the instructions in Chapter 8.

To perform maintenance and troubleshooting tasks, see Chapter 10.

1.7 Customer service

The best source for customer service on your NOC system is the overall system supplier. Please contact your system supplier first to ensure the fastest resolution. To contact Micro Motion for direct support on the flowmeter components, phone the support center nearest you:

- In the U.S.A., phone **800-522-MASS** (800-522-6277) (toll-free)
- In Canada and Latin America, phone +1 303-527-5200
- In Asia:
  - In Japan, phone 3 5769-6803
  - In other locations, phone +65 6777-8211 (Singapore)
- In Europe:
  - In the U.K., phone 0870 240 1978 (toll-free)
  - In other locations, phone +31 (0) 318 495 555 (The Netherlands)

Customers outside the U.S.A. can also email Micro Motion customer service at *International.MMISupport@EmersonProcess.com*.

Chapter 2
NOC System Overview

2.1 Overview

This chapter discusses various topics that should be reviewed and considered before beginning configuration of the Net Oil Computer Software and the NOC system. Topics include:

- Terminology – see Section 2.2
- Internal structure of the Net Oil Computer Software – see Section 2.3
- Sensor input to the Net Oil Computer Software – see Section 2.4
- Operation mode – see Section 2.5
- Required well data – see Section 2.6
- Water cut determination – see Section 2.7
- Temperature correction – see Section 2.8
- Pressure correction – see Section 2.9
- Pressure compensation – see Section 2.10
- Transient bubble remediation (TBR) – see Section 2.11
- Using data from the NOC system – see Section 2.12
- Using the Recalculation feature – see Section 2.13
- Using event and alarm data – see Section 2.14

This chapter also includes a list of questions that should be answered before beginning configuration. See Section 2.15.

2.2 Terminology

The terminology used in the NOC system and the NOC documentation is defined in Table 2-1.

Table 2-1 NOC system terminology

Term	Also called	Definition
ROC809 platform		The ROC809 remote operations controller with all I/O and communications modules
NOC system		The ROC809 platform with the Net Oil Computer Software, and all sensors

Table 2-1 NOC system terminology *continued*

Term	Also called	Definition
Production fluid		The process fluid as produced initially from the well. Contains oil, gas, free water, mixture water, and possibly various solids (e.g., sand).
Three-phase separator		A separator that separates the production fluid into three distinct streams: gas, oil, and water
Two-phase separator		A separator that separates the production fluid into two distinct streams: gas and liquid (oil/water mixture)
Oil leg		The oil layer of a three-phase separator, or the process stream from that layer
Water leg		The water layer of a three-phase separator, or the process stream from that layer
Gas leg		The gas layer of a separator, or the process stream from that layer
Liquid leg	Oil leg Oil/water leg	The liquid layer of a two-phase separator, or the process stream from that layer
Transition		The point at which a substance changes from one phase or flow regime to another
Interface		The boundary between two layers in a separator
Rag layer		Slang term for the interface between the oil leg and the water leg
Oil		The general term applying to oil in any form
Live oil		Fluid that is predominantly oil at process pressure and unspecified temperature
Dead oil	Weathered oil	Live oil that has been exposed to atmospheric pressure for sufficient time to allow the light ends to evaporate
Wet oil		Oil that contains water, either in a mixture or as free water, or both, at unspecified temperature and pressure
Dry oil		Oil that has been treated so that only very small quantities of water and other extraneous materials remain in it. This is the oil that is considered to be pure oil in net oil measurements.
Net oil		Dry oil by volume, corrected to reference temperature and pressure
Liquid	Oil/water mixture Emulsion	The production fluid after gas has been removed, or the process stream from the liquid leg of a two-phase separator. Contains oil and water.
Total water	Produced water	All water in the production fluid; the sum of free water and mixture water
Free water		The water produced with oil that settles out quickly in a three-phase separator; the water in the water leg of a three-phase separator; the fluid stream that is considered to be pure water in net oil measurements
Mixture water		The water dispersed in the liquid
Uncorrected		Field measurements at process temperature and pressure
Corrected, correction		Field measurements converted to the equivalent values at reference temperature and pressure. If a pressure value is not available, only temperature correction is applied.
Process temperature		The temperature of the process fluid at process conditions
Process pressure		The pressure at process conditions
Reference temperature	Base temperature	The temperature to which field measurements are corrected
Reference pressure	Base pressure	The pressure to which field measurements are corrected
Compensation		Modification of density and mass measurements as required to compensate for the effect of pressure on the sensor flow tubes

Table 2-1 NOC system terminology *continued*

Term	Also called	Definition
Water cut		Percentage of water in the liquid, usually measured by volume
Density-based water cut		Water cut value derived from measured density values
Water cut probe		Any of a variety of technologies that produces a direct measurement of water cut
Applied water cut		The water cut value used in NOC measurements: either the density-based water cut or the water cut probe value is used
Oil density at reference		The density of dry oil corrected to reference temperature and 1 ATM pressure
Water density at reference		The density of water corrected to reference temperature and 1 ATM pressure

2.3 Internal structure of the Net Oil Computer Software

The Net Oil Computer Software is a ROC809 user program. It was loaded onto the ROC809 platform during installation (see the manual entitled *Micro Motion Net Oil Computer Software and NOC System: Installation Manual*). The Net Oil Computer Software has the following structure:

- NOC Station display – Station configuration and data, and gas measurement configuration and data (optional). The NOC system performs NOC measurement for one station.
- Well Data display – Well configuration and history for each well.
- MMI Interface display – Sensor configuration and process data for Micro Motion sensors.
- NOC Meter display – NOC measurement configuration and real-time calculated data. Each NOC measurement sensor is configured and monitored separately.
- NOC Recalc display – Recalculation functions for the ten most recent contract periods (Continuous mode) or for the ten most recent well tests performed within the ten most recent contract periods (Well Test mode)

2.4 Sensor input to the Net Oil Computer Software

Figures 2-1 and 2-2 illustrate two possible implementations of the Net Oil Computer Software, supporting two different sensor input options:

- In Figure 2-1, two MMI sensors are installed on the oil leg, one MMI sensor is installed on the water leg, and one MMI sensor is installed on the gas leg.
- In Figure 2-2, one MMI sensor is installed on the oil leg, one MMI sensor is installed on the water leg, and a conventional meter is installed on the gas leg.

Note: These figures illustrate all sensor types, but do not illustrate all possible combinations.

As shown in these figures:

- The NOC Station, NOC Meters, MMI Interface, and Gas Station are structures in the Net Oil Computer Software.
- Each MMI sensor has a corresponding MMI Interface.
- Each MMI sensor used for NOC measurement has a corresponding NOC Meter.
- All NOC Meter data is rolled up to the NOC Station.
- Gas data is handled separately from oil data. Raw gas data is input to a gas station which is defined on the ROC809 platform using standard ROCLINK methods. The ROC809 gas station applies AGA (or other) calculations to the gas data, and the results are input to the NOC Gas Station in the Net Oil Computer Software. The Net Oil Computer Software reports the gas data but does not perform any additional processing.
  - If an MMI sensor is used for gas measurement, MMI Interface #4 is used to accept input from the sensor and route data to the ROC809 gas station (see Figure 2-1).
  - If a conventional meter is used for gas measurement, an analog input is used to accept input from the meter and route data to the ROC809 gas station (see Figure 2-2).

Figure 2-1 Conceptual view #1

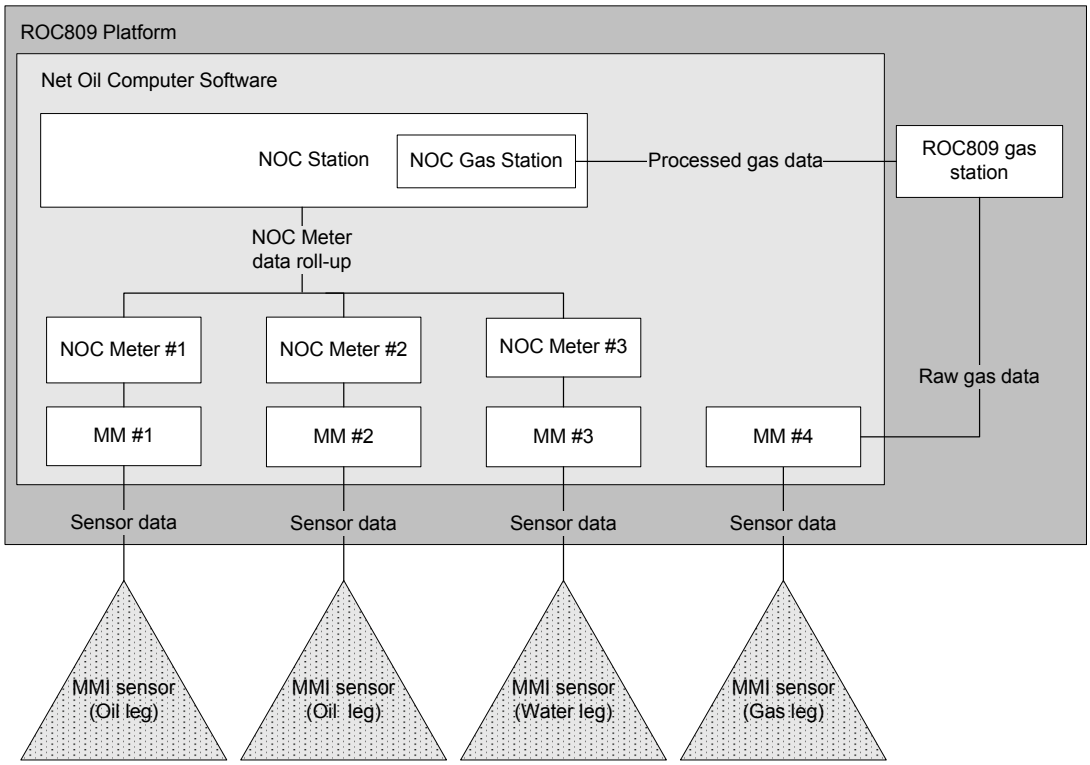
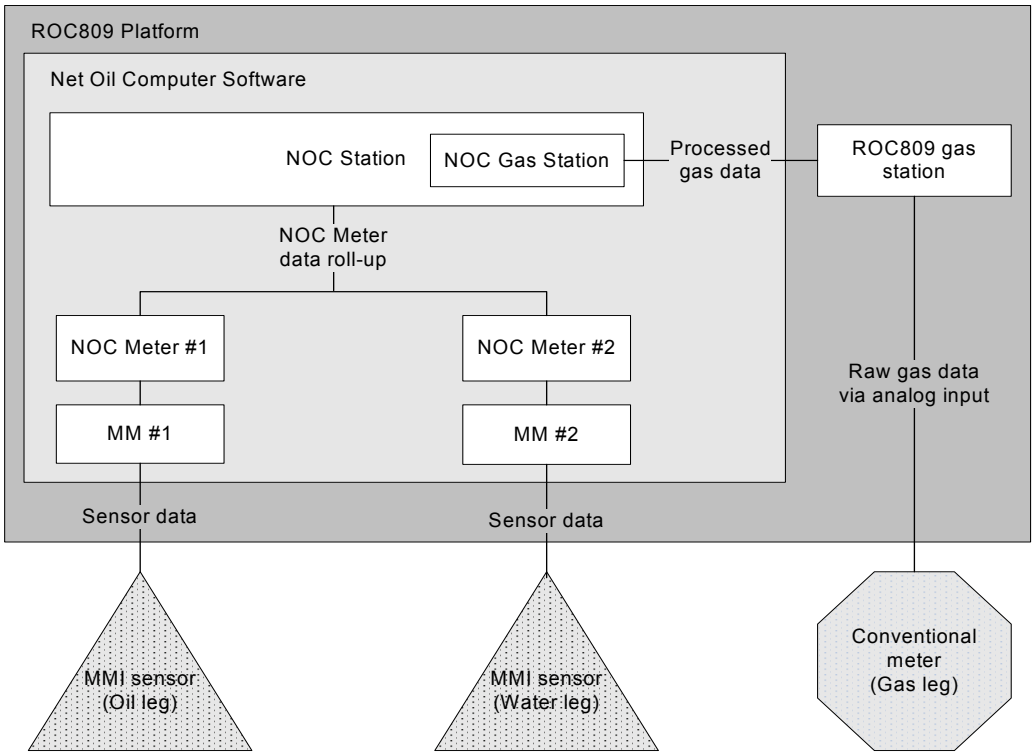


Figure 2-2 **Conceptual view #2**



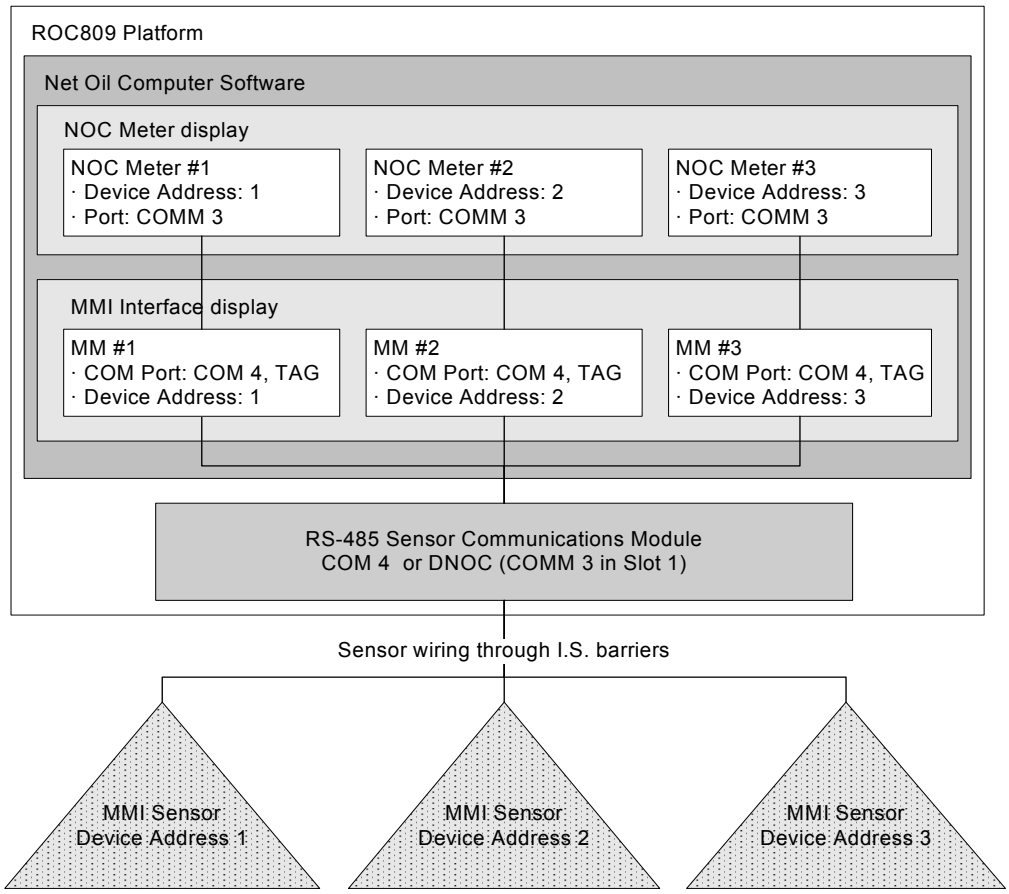
2.4.1 Mapping NOC Meters to MMI sensors

Figure 2-3 illustrates the standard method for mapping NOC Meters to MMI sensors. You may be using one, two, or three NOC Meters.

As shown in Figure 2-3:

- A Modbus device address is assigned to each MMI sensor. This address resides in the sensor's core processor. Typically, this configuration step is performed at the factory, and device addresses 1, 2, and 3 are assigned. If the device addresses are not preconfigured:
  - The default Modbus address for a core processor is 1.
  - If you need to change the default address, use ProLink II to connect directly to the core processor.
- All MMI sensors communicate with the ROC809 and the Net Oil Computer Software through the RS-485 sensor communications module, which is typically installed in ROC809 COM 4 (also called COMM3 or DNOC).
- An MMI Interface must be configured for each MMI sensor. The MMI Interface must identify:
  - The comm port where the RS-485 sensor communications module is installed
  - The Modbus device address of the Micro Motion sensor to use
- The NOC Meters are automatically mapped to the corresponding MMI Interfaces:
  - NOC Meter #1 → MM #1
  - NOC Meter #2 → MM #2
  - NOC Meter #3 → MM #3

Figure 2-3 Mapping NOC Meters to MMI sensors



2.4.2 Water leg measurement versus liquid leg measurement

The default NOC Meter configuration assumes that the NOC Meter is associated with an MMI sensor installed on the liquid or oil leg. In this configuration:

- The process fluid is assumed to be a mixture of oil and water.
- The "applied" water cut value is determined according to water cut configuration (see Section 2.7), and this value is applied to process fluid measurements.
- The applied water cut value is compared to the configured Free Water Setpoint (see Section 4.2.1) to determine how instant values, totals, and averages are updated:
  - When the applied water cut is equal to or below the Free Water Setpoint, the process fluid is treated as a combination of oil and water. Values for free water are not updated from this stream. Values for mixture water and total water will be updated.
  - When the applied water cut is above the Free Water Setpoint, the process fluid is treated as water. Only values for free water and total water are updated from this stream. Values for mixture water are not updated.

To use a NOC Meter on the water leg, set the Free Water Setpoint to 0. As a result:

- The process fluid is assumed to be water.
- No water cut options and calculations are applied.
- Only free water and total water values will be updated from this stream.

2.5 Operation modes

The NOC system operates in either Well Test mode or Continuous mode:

- In Well Test mode, well tests can be performed on up to 50 wells. A manifold system is used to ensure that output from a single well is routed through the test separator and the NOC system. See Figure 2-4.
- In Continuous mode, one well is measured continuously. See Figure 2-5.

After initial configuration, you can change the operation mode. However, changing modes affects current measurement, data collection, and tags. Before changing modes, see Sections 8.2.1 and 8.2.2.

Figure 2-4 Well Test mode

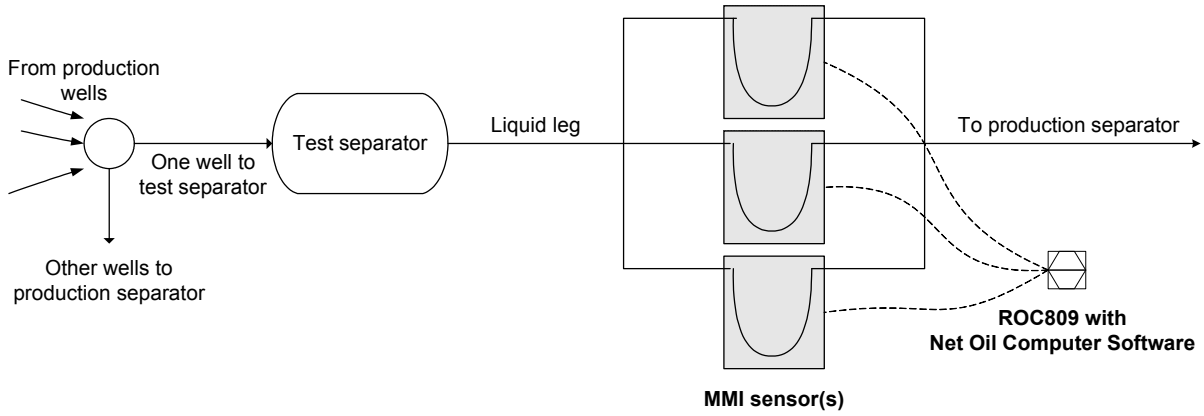
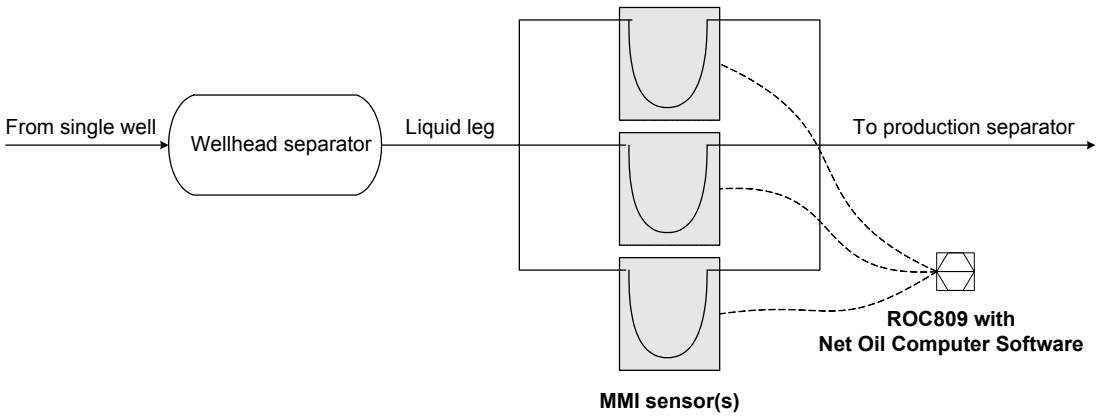


Figure 2-5 Continuous mode



2.6 Required well data

If you will use the density-based water cut, the following information is required for each well that will be tested or measured by the NOC system:

- Density of dry oil from this well, at reference temperature and 1 ATM pressure
- Density of the water from this well, at reference temperature and 1 ATM pressure
- Purge time (Well Test mode only)

If the density values are not known, you can perform an in-line density determination for oil, water, or both (see Chapter 7), or you can enter default values at initial configuration and recalculate measurement data at a later time when well-specific density values are known (see Section 8.7).

If you will use only water cut probes for water cut data, these density values are not required.

2.7 Water cut determination

You must configure water cut options for each NOC Meter that is measuring oil (i.e., each MMI sensor installed on the liquid leg). Do not configure water cut options for a NOC Meter that is measuring free water (i.e., the MMI sensor installed on the water leg).

There are two methods available for water cut determination:

- Density-based – The NOC equations are applied to derive water cut from measured density values.
- Water cut probe (WCP) – One or two water cut probes are used to measure the process stream directly. For example, you might use a capacitance probe at the low end and a microwave probe at the high end. Typically, the NOC system software receives data from these probes via an analog input.

If no water cut probe is installed, you must use the density-based water cut value. If one or two water cut probes are installed, you may:

- Ignore the WCP values for all NOC measurements
- Use the WCP values for all NOC measurements
- Define specific water cut ranges (a high end and/or a low end). Then:
  - If the water cut value falls within a specified range, the value from the associated WCP is used for NOC measurements.
  - If the water cut falls outside defined ranges, the density-based water cut value is used.

In all cases, the water cut value used in NOC measurements is called the “applied” value.

2.8 Temperature correction

Temperature correction refers to the conversion of the observed process temperature to the equivalent value at reference temperature.

The Net Oil Computer Software automatically applies temperature correction to NOC data. To perform temperature correction, the Net Oil Computer Software requires a value for the current process temperature. This value can be sourced from:

- The RTD built into the Micro Motion sensor
- An external RTD

You must configure the temperature input separately for each NOC Meter in the system.

2.9 Pressure correction

Pressure correction refers to the conversion of the observed process pressure to the equivalent value at reference pressure.

Note: Do not confuse pressure correction with pressure compensation. See Section 2.10 for a definition of pressure compensation.

Pressure correction will be automatically applied to NOC data if pressure data from an external pressure device is input to the Net Oil Computer Software. You must configure the pressure input separately for each NOC Meter in the system.

2.10 Pressure compensation

Pressure compensation refers to the modification of raw mass or density measurements as required to compensate for the effect of pressure on the sensor's flow tubes.

Note: Do not confuse pressure compensation with pressure correction. See Section 2.9 for a definition of pressure correction.

Pressure compensation for mass or density is implemented in the Net Oil Computer Software, in the MMI Interface and NOC Meter displays.

Note: To avoid applying pressure compensation twice to one set of data, ensure that the pressure compensation factors in the core processor are set to 0 (see the manual entitled Micro Motion Net Oil Computer Software and NOC System: Installation Manual*).*

Typically, pressure compensation should be implemented for all Micro Motion sensors in the NOC system. To implement pressure compensation, the following sensor-specific information is required:

- Compensation coefficient for mass flow – the percent change in the flow rate per psi
- Compensation coefficient for density – the change in fluid density, in $g/cm^3/psi$

These values are provided in the product data sheet for your sensor. Use the pressure effect values calculated in PSI.

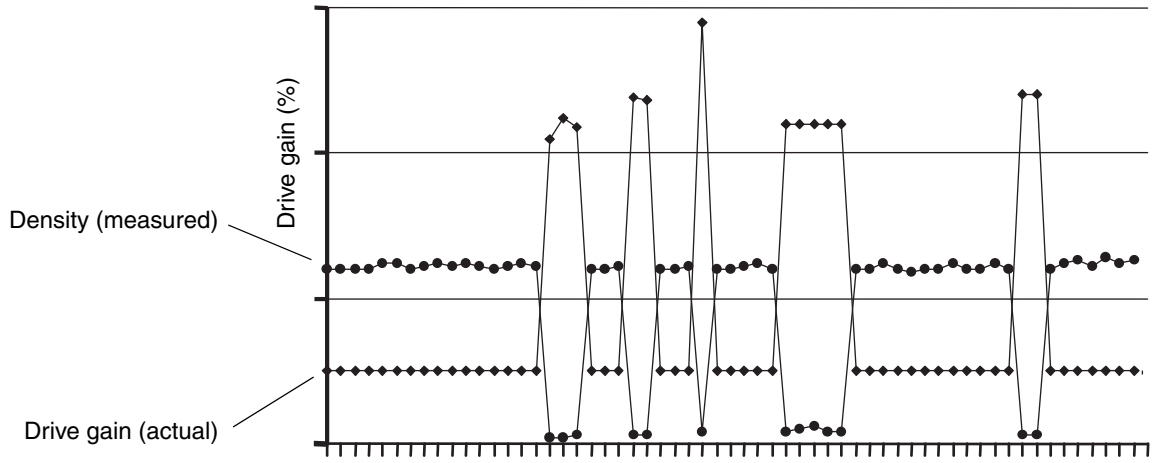
Note: Do not reverse the sign. Unlike other Micro Motion products, the Net Oil Computer Software reverses the sign in its internal calculations.

Note: Not all sensors require pressure compensation. See the sensor's product data sheet.

2.11 Transient bubble remediation (TBR)

Because density is used to calculate water cut, which is used to calculate net oil, transient bubbles have a negative effect on NOC measurement accuracy. Figure 2-6 shows the effect of transient bubbles on density.

Figure 2-6 Effect of transient bubbles on density



TBR is used to handle occasional gas bubbles or slugs in the process fluid. A transient bubble condition is defined in terms of the sensor's drive gain: if the drive gain exceeds the configured threshold for more than three seconds, the configured TBR actions are performed. The transient bubble interval persists until drive gain is below the configured threshold for three seconds.

The Net Oil Computer Software can perform several different actions if transient bubbles are detected:

- Substituting a retrieved density value for the measured density value in NOC calculations (the Correct Density option). This option is described in Section 2.11.1.
- Logging an alarm
- Energizing a discrete output
- All of the above

2.11.1 Correct Density option

The Correct Density option directs the Net Oil Computer Software to retrieve the measured density value from an earlier point in the process. The earlier point is identified by the Lookback Period (see Figure 2-7). The density values from a three-second period around this point are averaged, and this retrieved density average is then used in NOC calculations. Figure 2-8 shows how the Correct Density action affects the density measurement.

Note: If the Lookback Period happens to fall into a previous transient bubble interval, the Net Oil Computer Software automatically extends the lookback interval as required to retrieve an averaged value from measured density values rather than substituted density values.

Figure 2-7 **Correct Density option**

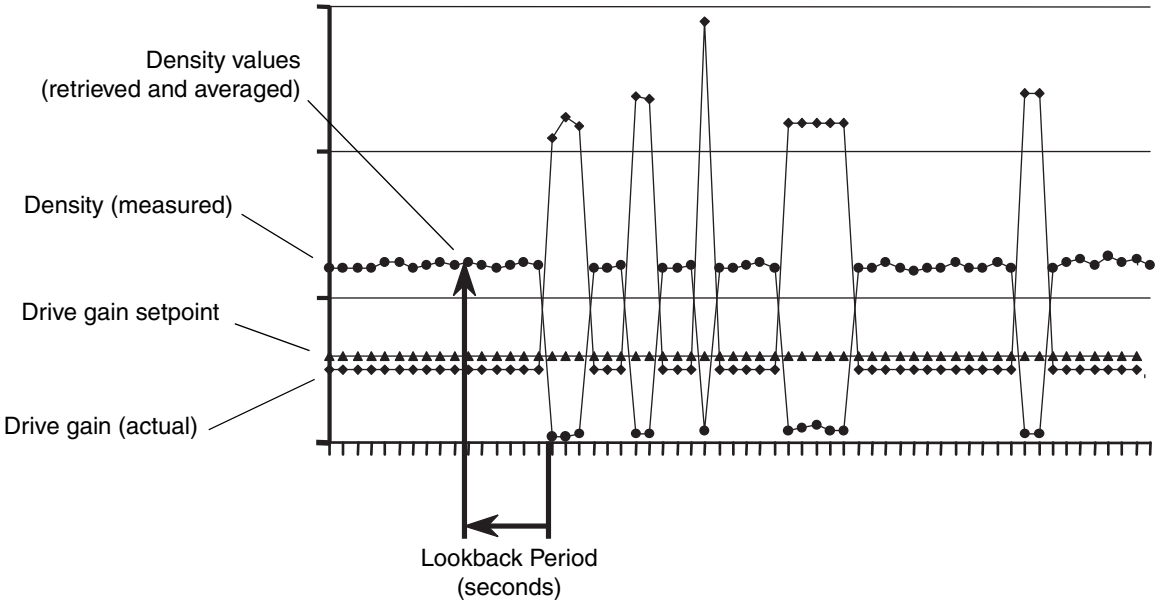
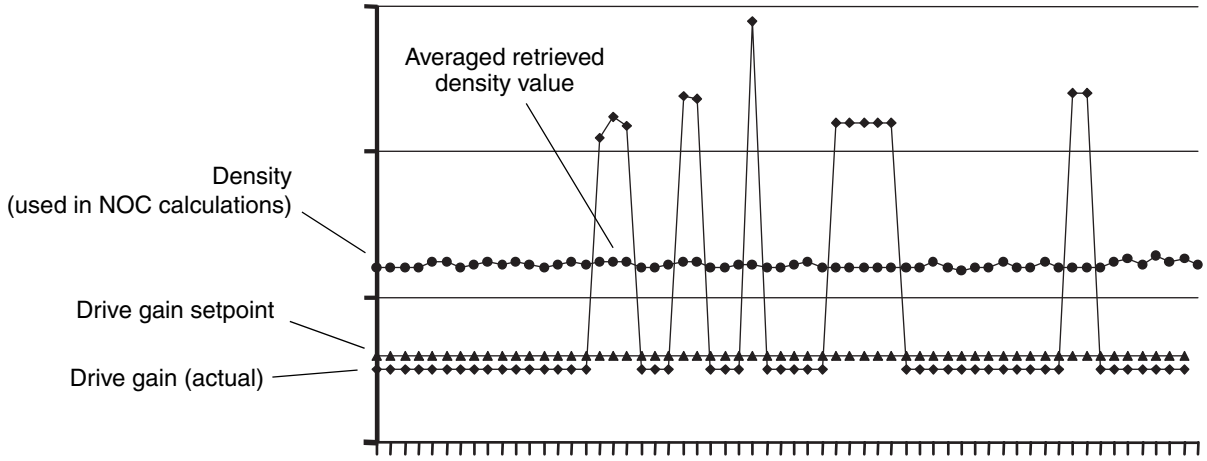


Figure 2-8 **Correct Density effect on density measurement**



2.12 Using NOC data

NOC data is stored in the internal history database:

- In Well Test mode, the database can store data for 50 wells, six tests per well. As additional well tests are performed, older tests are overwritten.
- In Continuous mode, data for a single well is stored. In the default configuration, data for the 35 most recent contract periods (typically, days) may be stored. Older data is stored in summary form, and the detailed data is overwritten.

Micro Motion recommends accessing NOC data through the Net Oil Computer Software instead of the ROCLINK 800 history interface. Be sure that you view all required data before it is overwritten. See Chapter 8 for information.

Note: The organization of NOC data in history is designed to support NOC calculations rather than user access. Although you can view data, it is not easy to interpret.

For archival purposes, history data can be retrieved through the ROCLINK 800 history interface. Information on the default history configuration and on accessing history data is provided in the manual entitled *ROCLINK 800 Configuration Software: User Manual*.

2.13 Using the Recalculation feature

The Recalculation feature is used to convert existing NOC data to:

- Different measurement units
- A different time base
- A different reference temperature
- A different oil density at reference temperature
- A different water density at reference temperature

The Recalculation feature uses the periodic (15-minute) history records. Accordingly:

- You cannot perform recalculation for well tests or contract periods for which no periodic record was written. If the well test or contract period was shorter than 15 minutes, it cannot be recalculated.
- Periodic records are kept in history for ten days. After this time, they are deleted. Be sure to perform all required recalculations while the periodic records are still available.

When a well test or contract period is recalculated, new NOC data can be saved to history if desired. The original NOC data is not overwritten. NOC data produced by recalculation is shown along with the original data on the Well History panel (see Figure 4-21).

Only one set of recalculated data is saved. If you recalculate the same well test or contract period more than once, the most recent recalculated data overwrites the previous recalculated data.

For ease in comparison, the recalculated data is saved to history in the units used for the original data. However, all changes resulting from new values for oil density at reference temperature and water density at reference temperature are preserved.

2.14 Using event and alarm data

The 240 most recent events and 240 most recent alarms are stored in an internal database. Several methods are available for using event and alarm data:

- Contents of the databases can be viewed, printed, saved to a file, or exported for use in an external program.
- A host system can connect to the ROC809 platform and retrieve the data.

Information on accessing event and alarm data is provided in the manual entitled *ROCLINK 800 Configuration Software: User Manual*. Be sure that you retrieve all required data before it is overwritten.

2.15 Planning the configuration

This section contains a set of questions that you should answer before beginning basic configuration of the Net Oil Computer Software and the NOC system.

Note: These questions are specific to implementation of the NOC system. They do not address basic system configuration (e.g., configuring the system clock, security, communications, etc.).

- Will this system be used for well testing or for continuous measurement?
- If it will be used for well testing, what wells will be tested?
- For all wells that will be measured:
  - What is the oil density at reference temperature? If not known, will you perform a density determination?
  - What is the water density at reference temperature? If not known, will you perform a density determination?
  - (Well Test mode only) What is the well's purge time?
- How many MMI (Coriolis) sensors will be used for NOC measurement on the liquid leg?
- Is an MMI sensor installed on the water leg?
- Does the system include gas measurement? If so, is an MMI sensor or a conventional meter used?
- What are the Modbus device addresses of the MMI sensors?
- What measurement units will be used for NOC measurement?
- Will TBR be configured? If yes, for each MMI sensor, what drive gain will be used as a TBR threshold?
- What method will be used for water cut determination? If you will use a water cut probe, what is its effective range?
- Will pressure compensation be configured?
- What inputs will be configured on this system? Possible inputs include:
  - External temperature sensor (RTD input)
  - Water cut probe (analog input)
  - Pressure sensor (analog input)
  - Level sensor (analog input)
  - External alarm indication (discrete input)
- What outputs will be configured on this system? Possible outputs include:
  - Valve control (analog output)
  - Pump or device control (discrete output or discrete output relay)
  - Alarm indication (discrete output or discrete output relay)
  - TBR implementation (discrete output or discrete output relay)
  - Frequency or pulse output simulation (discrete output or discrete output relay)

Chapter 3
Setting Up the ROC809 Platform

3.1 About this chapter

This chapter describes the procedures required to set up the ROC809 platform before you begin configuring the Net Oil computer software. Topics include:

- Configuring the ROC809 platform – see Section 3.2
- Verifying the Net Oil Computer Software – see Section 3.3
- Verifying the startup configuration file – see Section 3.4

3.2 Configuring the ROC809 platform

Configuration of the ROC809 platform includes all configuration that is external to the Net Oil Computer Software. This includes items such as:

- Basic configuration
  - ROC clock
  - Configuring security for ROCLINK 800
  - Configuring security for the ROC809 platform
  - Defining devices and groups
  - Configuring device information
  - Configuring display options
  - Configuring ROC809 comm ports
  - Configuring ROCLINK 800 communications parameters
  - Configuring I/O
  - Calibrating analog and RTD inputs
- Advanced configuration
  - Configuring FSTs
  - Configuring PID control loops

For information on configuring the ROC809 platform, see the manual entitled *ROCLINK 800 Configuration Software: User Manual*. When configuring the ROC809 platform, follow recommended practices such as saving the configuration file to flash memory during configuration, and saving to both flash memory and a file after configuration is complete.

Note: You may want to return to specific configuration tasks after the NOC system is configured. For example, you may want to modify I/O configuration or add an FST.

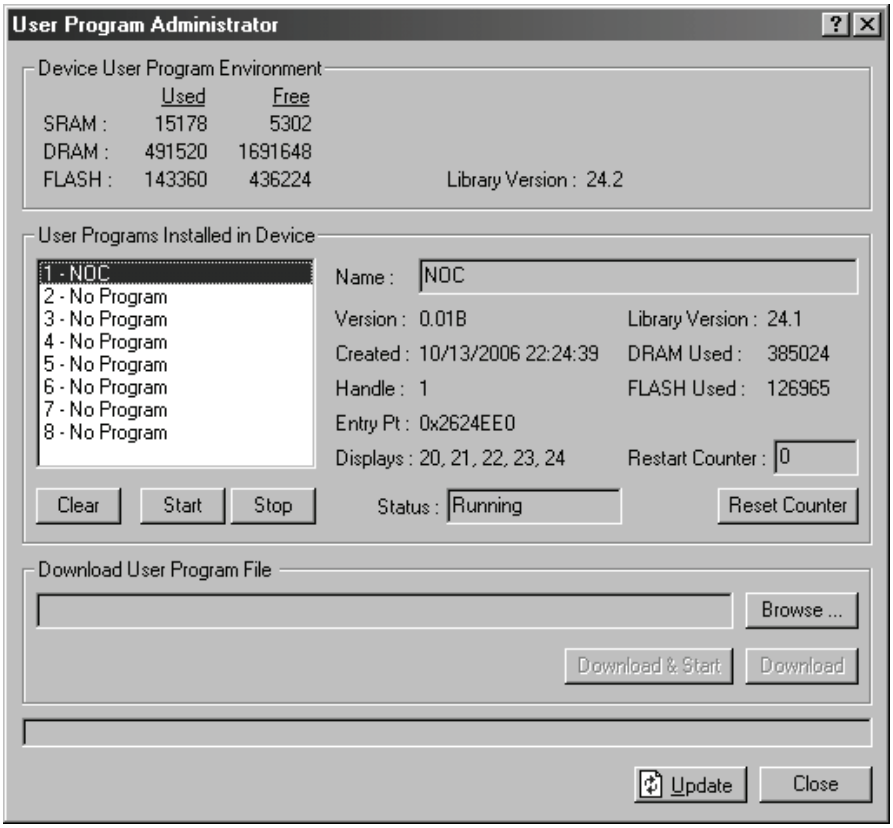
3.3 Verifying the Net Oil Computer Software

To verify that the Net Oil Computer Software is installed and running:

1. Start ROCLINK 800.
2. Connect to the ROC809.
3. Click **Utilities > User Program Administrator**. The window shown in Figure 3-1 is displayed.
4. The Net Oil Computer Software should be displayed in the list. Highlight the Net Oil Computer Software. If its status is shown as **Loaded**, click the **Start** button. The status will change to **Running**.
5. Click **Close**.

If you do not see the Net Oil Computer Software, load the software as described in the manual entitled *Micro Motion Net Oil Computer Software and NOC System: Installation Manual*.

Figure 3-1 User Program Administrator window



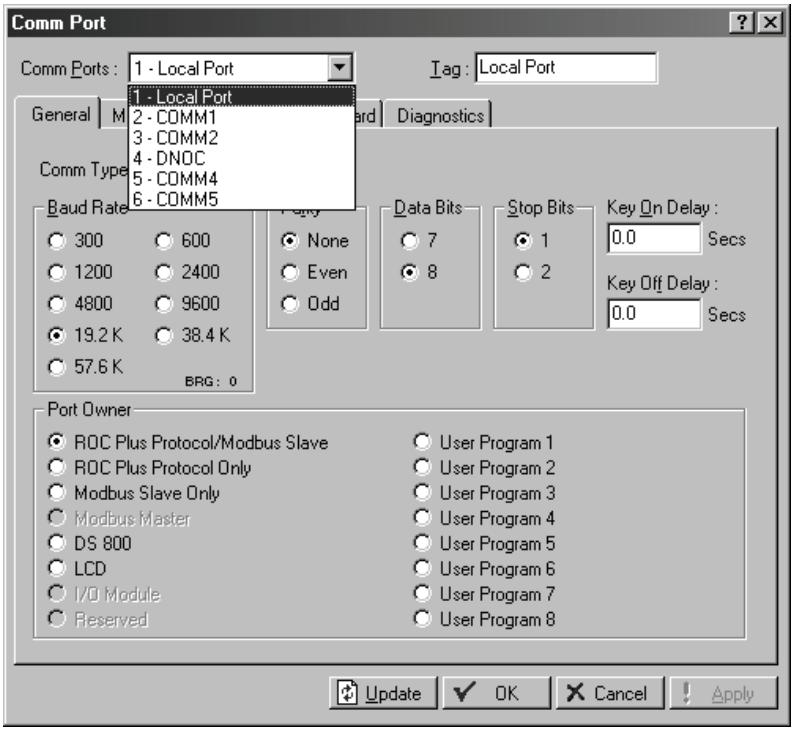
3.4 Verifying the startup configuration file

NOC system configuration must begin with one of the two startup configuration files shipped with the Net Oil Computer Software. During installation, the selected file was downloaded to the ROC809. To verify:

1. Start ROCLINK 800.
2. Connect to the ROC809.
3. Click **Device > Comm Ports**.

4. Open the list of comm ports, and check the name of the fourth port.
   - If it is named DNOC, a startup configuration file was loaded. Both startup configuration files use this port and rename it for user convenience.
   - If it is named COMM3, a startup configuration file was not loaded. Download the appropriate startup configuration file, as described in the manual entitled *Micro Motion Net Oil Computer Software and NOC System: Installation Manual*.
5. Click **Close**.

Figure 3-2 Verifying the startup configuration file



Chapter 4
Net Oil Computer Software Displays

4.1 About this chapter

This chapter is designed to be used for reference. It describes all of the displays and panels that are available for the Net Oil Computer Software via ROCLINK 800, including:

- NOC Station display – see Section 4.2
- MMI Interface display – see Section 4.3
- NOC Meter display – see Section 4.4
- Well Data display – see Section 4.5
- NOC Recalc display – see Section 4.6

For information on using these displays and panels to configure the Net Oil Computer Software, see Chapter 5. For information on using these displays and panels for NOC measurement or recalculation, see Chapter 8.

For a detailed listing of the user-defined points in the Net Oil Computer Software, see Appendix A.

4.2 NOC Station display

The NOC Station display includes six panels:

- General – see Section 4.2.1
- Units – see Section 4.2.2
- Totals – see Section 4.2.3
- Averages – see Section 4.2.4
- Well Selection – see Section 4.2.5
- Alarms – see Section 4.2.6

4.2.1 NOC Station display – General panel

There are two versions of the NOC Station General panel: the version displayed depends on the configured Operation Mode. See Figures 4-1 and 4-2 and Table 4-1.

Operation Mode can be configured from any point in the NOC Station display, using the dropdown list at the top of the display. For more information about Operation Mode, see Section 2.5 and Section 8.2.

Figure 4-1 **NOC Station display – General panel, Well Test mode**

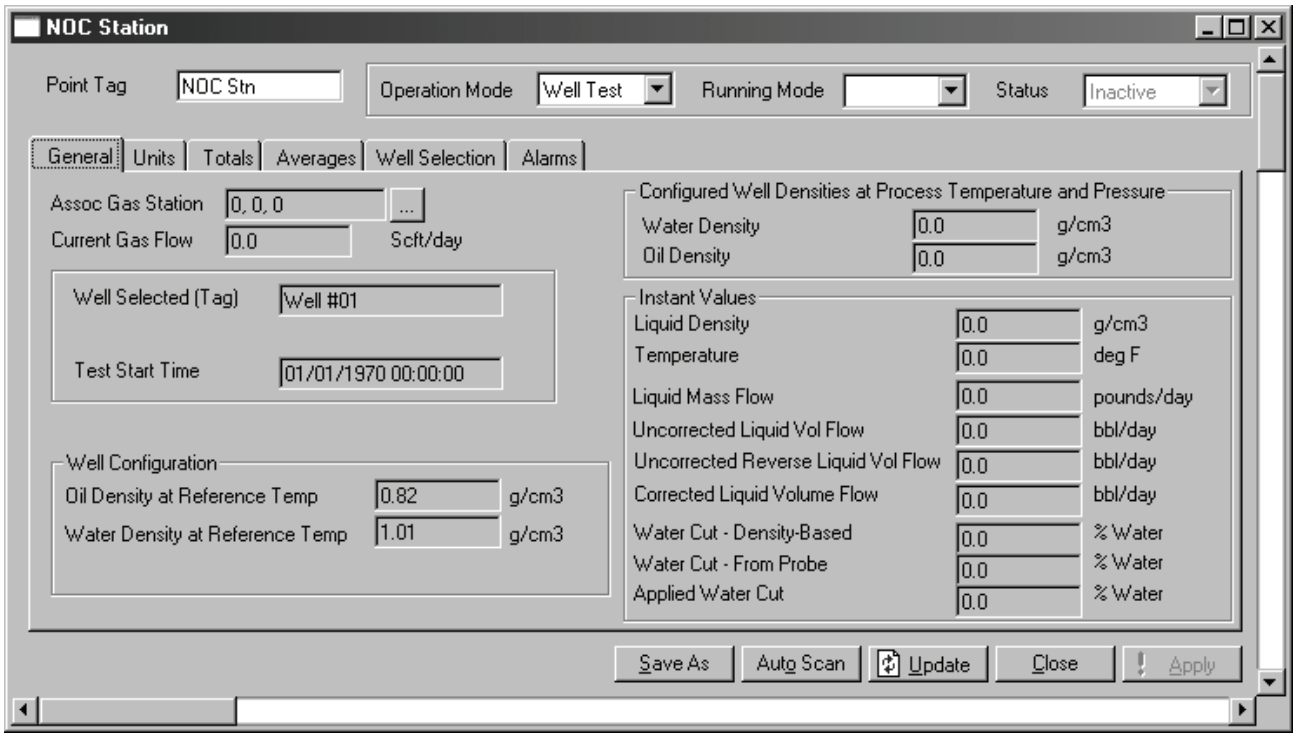


Figure 4-2 **NOC Station display – General panel, Continuous mode**

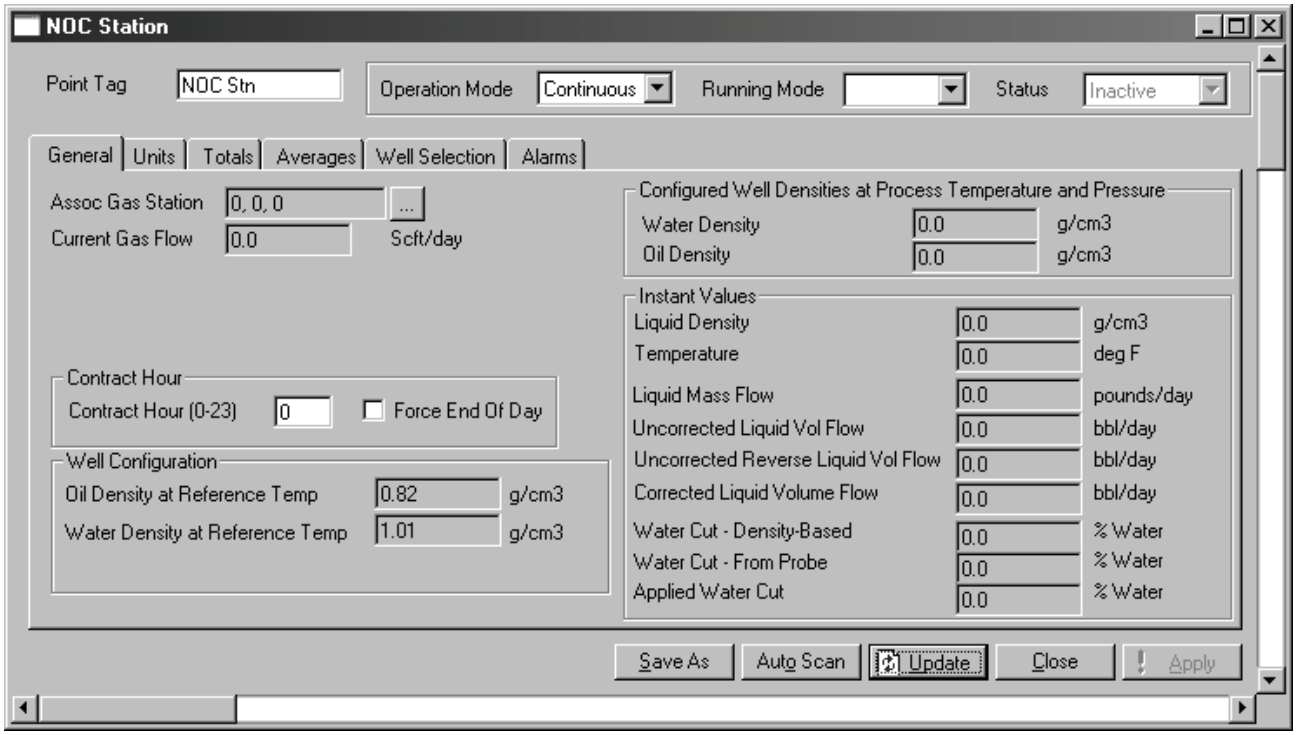


Table 4-1 NOC Station parameters – General panel

Parameter	Description	Comments
Point Tag	Name of this NOC Station	This name is not the same as the Station Tag defined in the ROCLINK 800 Meter menu (used for gas measurement).
Assoc Gas Station	Specifies the point from which gas flow data will be read (the ROC809 gas station)	Required only for systems that include a gas measurement meter
Current Gas Flow	Displays the current gas flow rate	Only if gas measurement is configured
Contract Hour	(Operation Mode = Continuous) Specifies the hour, in a 24-hour period, at which values are totaled for a single day's production, totals are reset, and data is logged to the Daily History database	Default: 0 (midnight) Range: 0 to 23 (11 p.m.)
Force End Of Day	(Operation Mode = Continuous) Used to perform contract-hour actions manually	See Section 8.3
Well Selected	(Operation Mode = Well Test) Displays the tag of the currently selected well	
Test Start Time	(Operation Mode = Well Test) Displays the start time of the current test	If no test is in progress, displays the start time of the most recent test
Well Configuration		
Oil Density at Reference Temp	Displays the oil density at reference temperature for the selected well	Read only; value configured on Well Data display, Configuration panel (see Section 4.5.1)
Water Density at Reference Temp	Displays the water density at reference temperature for the selected well	Read only; value configured on Well Data display, Configuration panel (see Section 4.5.1)
Configured Well Densities at Process Temperature and Pressure		
Water Density	Displays the water density configured for the selected well, converted to process temperature and pressure	
Oil Density	Displays the configured live oil density for the selected well, converted to process temperature and pressure	
Instant Values	*All instant values are rolled up from the NOC Meters.*	
Liquid Density	Displays the current measured density of the process stream	
Temperature	Displays the current measured temperature of the process stream	
Liquid Mass Flow	Displays the current mass flow rate for the process stream	
Uncorrected Liquid Vol Flow	Displays the current volume flow rate, forward flow only, for the process stream, uncorrected for temperature or pressure	
Uncorrected Reverse Liquid Vol Flow	Displays the current volume flow rate, reverse flow only, for the process stream, uncorrected for temperature or pressure	
Corrected Liquid Volume Flow	Displays the current volume flow rate, forward flow only, for the process stream, corrected for temperature and pressure	
Water Cut – Density-Based	Displays the current water cut derived from density values by the Net Oil Computer Software	See Section 2.7
Water Cut – From Probe	Displays the current water cut as measured by the relevant water cut probe (high end or low end)	See Section 2.7
Applied Water Cut	Displays the water cut currently being used for NOC measurement	See Section 2.7

4.2.2 NOC Station display – Units panel

The NOC Station Units panel is used to select the units that will be used in NOC calculations and measurement, and to specify the reference temperature. See Figure 4-3 and Table 4-2.

Figure 4-3 NOC Station display – Units panel

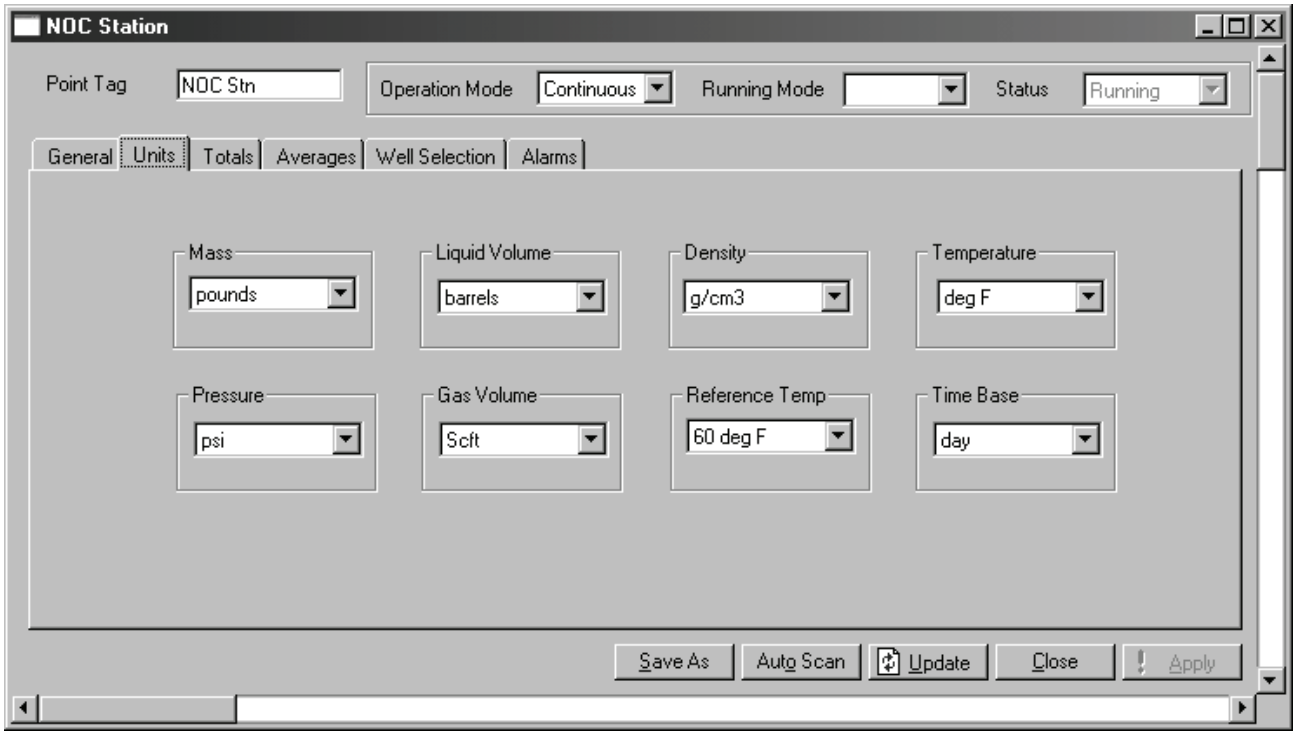


Table 4-2 NOC Station parameters – Units panel

Parameter	Description	Comments
Mass	The mass unit to be used in NOC calculations	
Pressure	The pressure unit to be used in NOC calculations	
Liquid Volume	The liquid volume unit to be used in NOC calculations	
Gas Volume	The gas volume unit to be used in NOC calculations	
Density	The density unit to be used in NOC calculations	
Reference Temperature	The reference temperature to which oil density and water density will be corrected during NOC calculations	If you change the reference temperature, update the Oil Density at Ref and Water Density at Ref values for all wells. See Table 4-16.
Temperature	The temperature unit to be used in NOC calculations	
Time Base	The time unit to be used in NOC calculations	

4.2.3 NOC Station display – Totals panel

The NOC Station Totals panel displays current NOC totals, rolled up from the NOC Meters. See Figure 4-4 and Table 4-3. In this panel, values are totaled for the current period:

- In Continuous mode, the current period runs from the most recent contract hour to the present moment.
- In Well Test mode, the current period runs from the beginning of the well test to the present moment.

Figure 4-4 NOC Station display – Totals panel

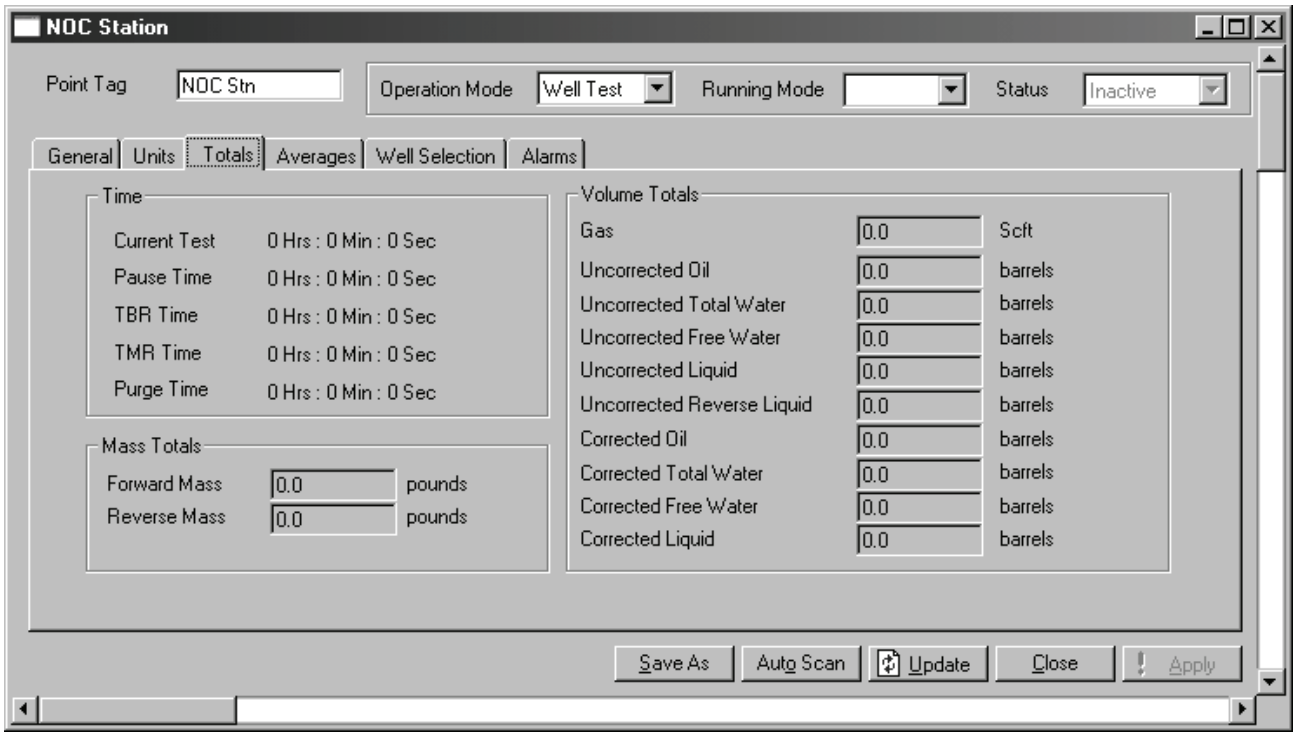


Table 4-3 NOC Station parameters – Totals panel

Parameter	Description	Comments
Time		
Current Test	The duration of the current test	If more than one NOC Meter is used, all meters start, stop, and pause at the same time. The individual meter values are not totaled. For example, if three meters are used in a test that lasts one hour, this field will report one hour rather than three hours.
Pause Time	The duration of all pauses during the current test	
TBR Time	The total number of hours, minutes, and seconds that the NOC system has detected a transient bubble condition.	Summed across NOC Meters. • If TBR is disabled, this field shows zeros. • If TBR is enabled, this field shows total TBR time, independent of the configured TBR action.
TMR Time	Not implemented in current version.	Will be used to track Transient Mist Remediation
Purge Time	(Operation Mode = Well Test) The total number of hours, minutes, and seconds that the NOC system has spent in purge state	Displayed only if Operation Mode is set to Well Test
Mass Totals	*All mass totals are rolled up from the NOC Meters.*	
Forward Mass	The total mass, forward flow only, measured by the NOC system in the current period	
Reverse Mass	The total mass, reverse flow only, measured by the NOC system in the current period	

Table 4-3 NOC Station parameters – Totals panel *continued*

Parameter	Description	Comments
Volume Totals	*All volume totals are rolled up from the NOC Meters*	
Gas	The amount of gas measured by the NOC system in the current period	
Uncorrected Oil	The amount of oil, uncorrected for temperature or pressure, measured by the NOC system in the current period	
Uncorrected Total Water	The amount of total water, uncorrected for temperature or pressure, measured by the NOC system in the current period	
Uncorrected Free Water	The amount of free water, uncorrected for temperature or pressure, measured by the NOC system in the current period	
Uncorrected Liquid	The amount of liquid, forward flow only, uncorrected for temperature or pressure, measured by the NOC system in the current period	
Uncorrected Reverse Liquid	The amount of liquid, reverse flow only, uncorrected for temperature or pressure, measured by the NOC system in the current period	
Corrected Oil	The amount of oil, corrected for temperature and pressure, measured by the NOC system in the current period	
Corrected Total Water	The amount of total water, corrected for temperature and pressure, measured by the NOC system in the current period	
Corrected Free Water	The amount of free water, corrected for temperature and pressure, measured by the NOC system in the current period	
Corrected Liquid	The amount of all liquid, corrected for temperature and pressure, measured by the NOC system in the current period	

4.2.4 NOC Station display – Averages panel

The NOC Station Averages panel displays current NOC averages, rolled up from the NOC Meters. See Figure 4-5 and Table 4-4. In this panel, values are averaged for the current period:

- In Continuous mode, the current period runs from the most recent contract hour to the present moment.
- In Well Test mode, the current period runs from the beginning of the well test to the present moment.

Figure 4-5 NOC Station display – Averages panel

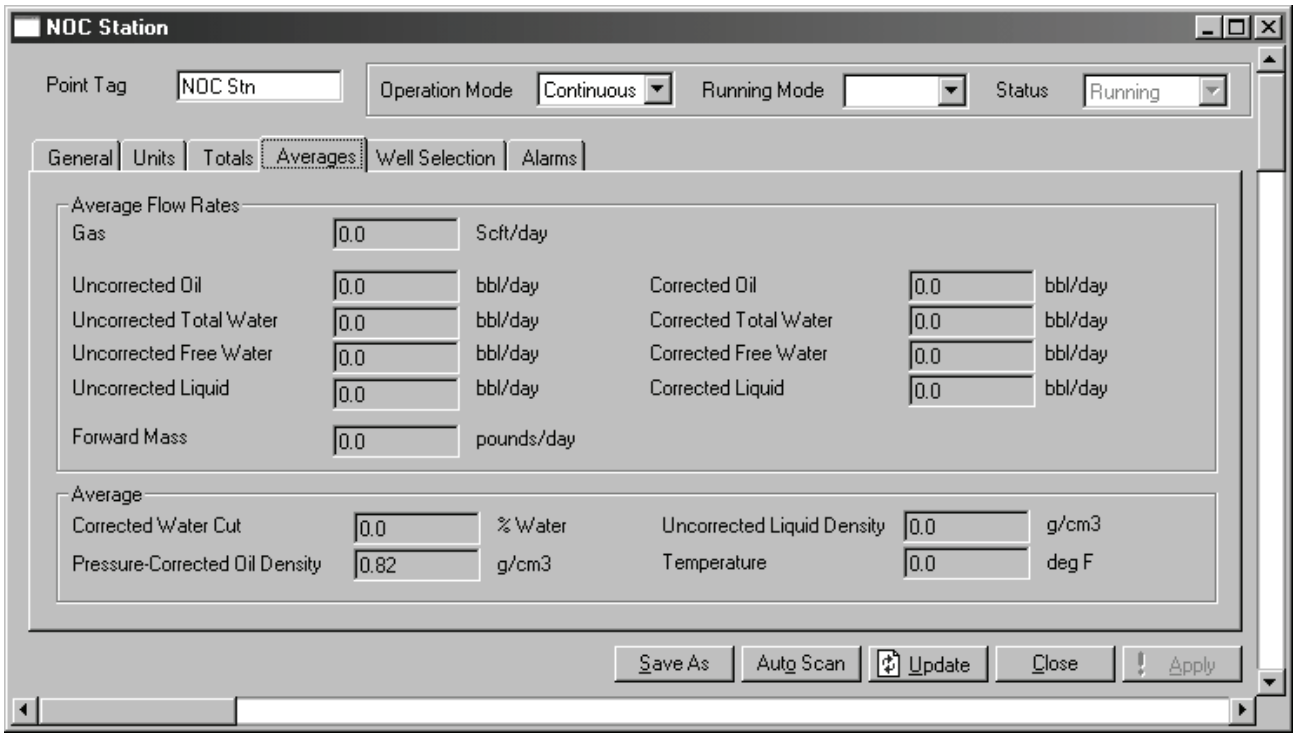


Table 4-4 NOC Station parameters – Averages panel

Parameter	Description	Comments
Average Flow Rates	*All average values in this section are rolled up from the NOC Meters and flow-weighted.*	
Gas	Average gas volume flow rate for the current period	
Uncorrected Oil	The average flow rate of oil for the current period, uncorrected for temperature or pressure	
Uncorrected Total Water	The average flow rate of total water for the current period, uncorrected for temperature or pressure	
Uncorrected Free Water	The average flow rate of free water for the current period, uncorrected for temperature or pressure	
Uncorrected Liquid	The average flow rate of the liquid for the current period, uncorrected for temperature or pressure	
Forward Mass	The average mass flow rate, forward flow only, for the current period	
Corrected Oil	The average flow rate of oil for the current period, corrected for temperature and pressure	
Corrected Total Water	The average flow rate of total water for the current period, corrected for temperature and pressure	
Corrected Free Water	The average flow rate of free water for the current period, corrected for temperature and pressure	
Corrected Liquid	The average flow rate of the liquid for the current period, corrected for temperature and pressure	

Table 4-4 **NOC Station parameters – Averages panel** *continued*

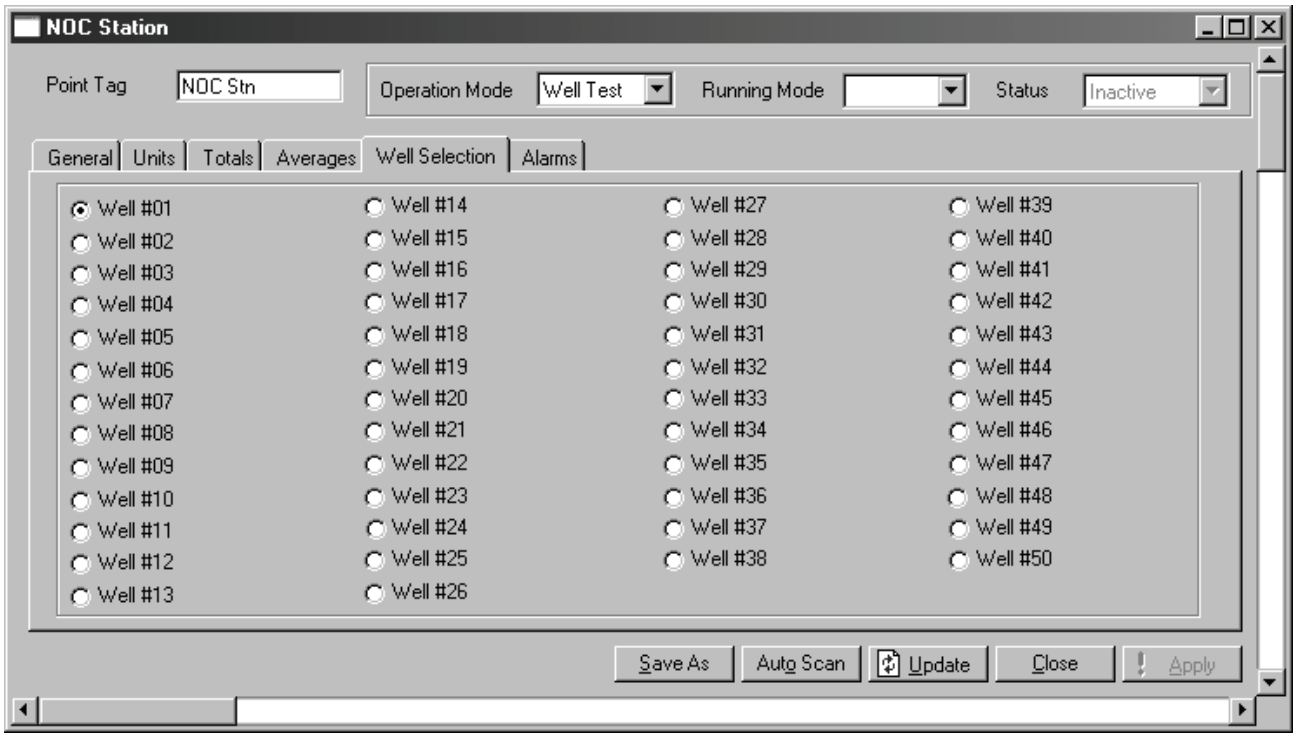
Parameter	Description	Comments
Average	*All average values in this section are rolled up from the NOC Meters and flow-weighted.*	
Corrected Water Cut	The average water cut applied during the current period, corrected for temperature and pressure	
Pressure-Corrected Oil Density	The average oil density for the current period, corrected for temperature and pressure	
Uncorrected Liquid Density	The average density of the liquid for the current period	
Temperature	The average temperature of the liquid for the current period	

4.2.5 NOC Station display – Well Selection panel

The Well Selection panel (see Figure 4-6) is used only in Well Test mode. It displays the well number and well tag for all fifty wells that can be part of the NOC system. To select a well for testing:

1. Click its radio button.
2. Click **Apply**.

Figure 4-6 **NOC Station display – Well Selection panel, Well Test mode**



4.2.6 NOC Station display – Alarms panel

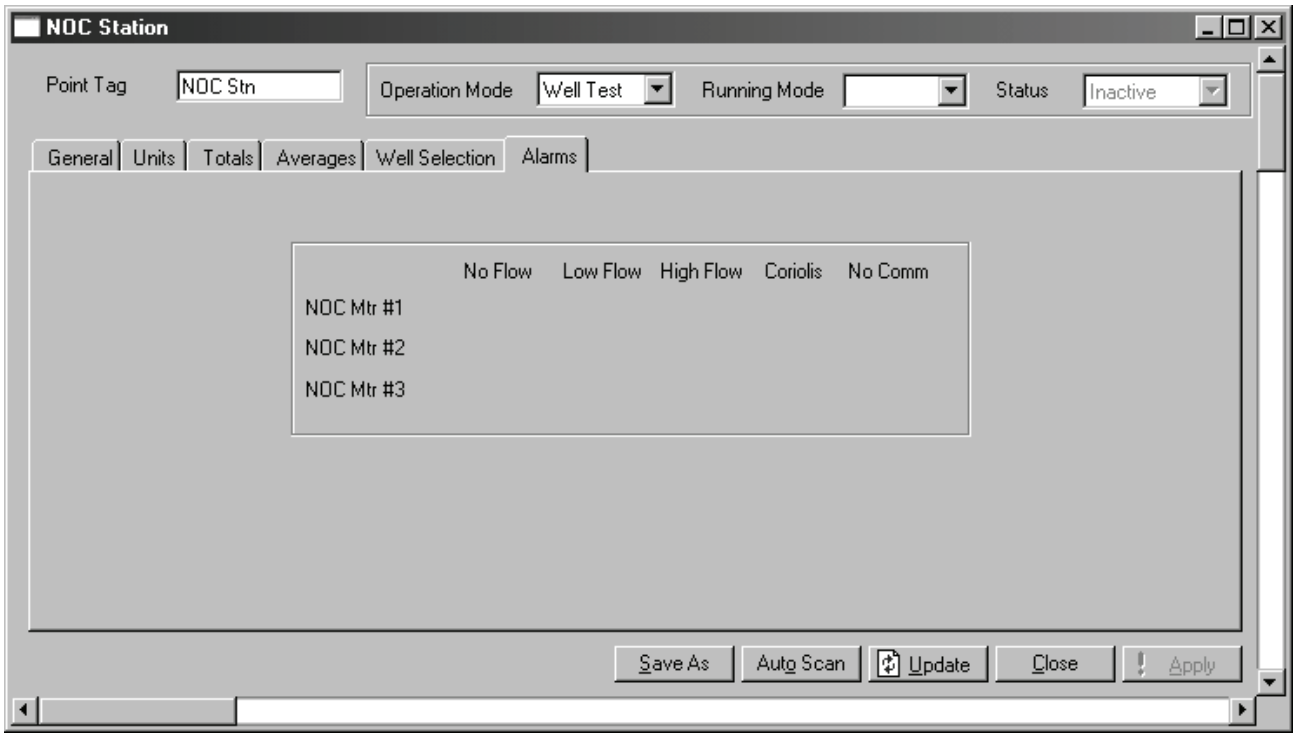
The NOC Station Alarms panel (see Figure 4-7) displays active alarms for the NOC Meters, in the following alarm categories:

- No Flow alarms, as defined by the Low Flow Cutoff value configured on the NOC Meter Inputs panel (see Section 4.4.2)
- Low Flow and High Flow alarms, as defined in the Alarms fields on the NOC Meter Alarms panel (see Section 4.4.7)
- Coriolis alarms – alarms posted by the Micro Motion sensor associated with the NOC Meter
- No Comm alarms – the NOC Meter is not communicating with the sensor

Note: Alarm conditions are indicated for all operational states: Continuous mode and Well Test mode with a well test running, paused, or inactive.

Note: The indicators on this panel do not distinguish between a continuous alarm condition and several short alarm conditions.

Figure 4-7 NOC Station display – Alarms panel



4.3 MMI Interface display

The MMI Interface display includes four panels:

- Comm Setup – see Section 4.3.1
- Registers – see Section 4.3.2
- Alarms – see Section 4.3.3
- Configuration – see Section 4.3.4

4.3.1 MMI Interface display – Comm Setup panel

The MMI Interface Comm Setup panel is used to specify the core processor from which the MMI Interface will receive data. See Figure 4-8 and Table 4-5.

Figure 4-8 MMI Interface display – Comm Setup panel

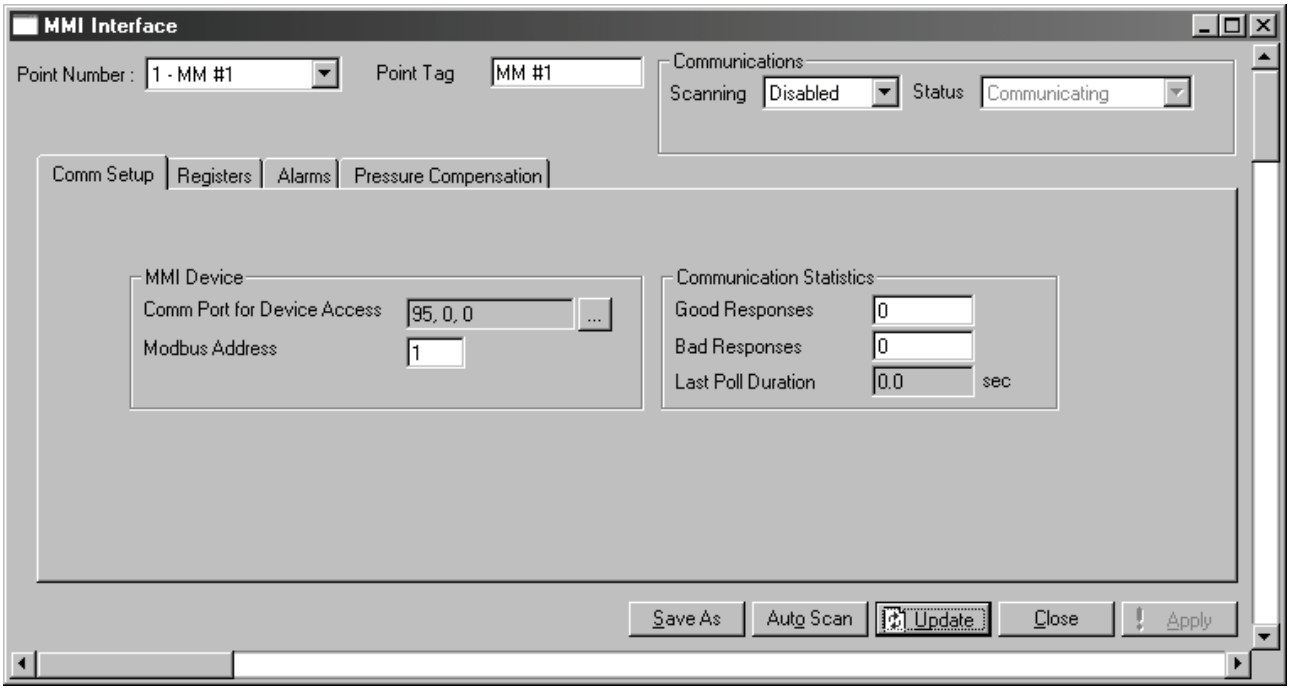


Table 4-5 MMI Interface parameters – Comm Setup panel

Parameter	Description	Comments
Point Number	The number of the currently selected Micro Motion sensor. Use the dropdown list to select a different sensor.	
Point Tag	The name of the currently selected Micro Motion sensor	
Scanning	• Enabled: The Net Oil Computer Software is polling the Micro Motion sensor for current data. • Disabled: The Net Oil Computer Software is not polling the Micro Motion sensor for current data.	
Status	• Communicating: The connection between the ROC809 and the Micro Motion sensor is active. • Not Communicating: The connection between the ROC809 and the Micro Motion sensor is not active.	Read-only
Comm Setup		
Comm Port for Device Address	The ID of the ROC809 comm port that is used to connect to Micro Motion sensors. This must be the port of the RS-485 module used for sensor communications.	In standard installations, this module is installed in Slot 1 (COMM 3, or DNOC), so the following TLP is used: **COM 4, TAG (DNOC 4, TAG) (95, 3, 0)**
Modbus Address	The Modbus address of the core processor on this Micro Motion sensor	Defaults: 1–4

Table 4-5 MMI Interface parameters – Comm Setup panel *continued*

Parameter	Description	Comments
Communication Statistics		
Good Responses	Displays the number of good responses from this Micro Motion sensor during the current period	
Bad Responses	Displays the number of bad responses from this Micro Motion sensor during the current period	
Last Poll Duration	Displays the duration of the last polling interval (the number of seconds between polls)	

4.3.2 MMI Interface display – Registers panel

The MMI Interface Registers panel displays current data from the core processor. See Figure 4-9 and Table 4-6. All values displayed on this panel are read-only.

Figure 4-9 MMI Interface display – Registers panel

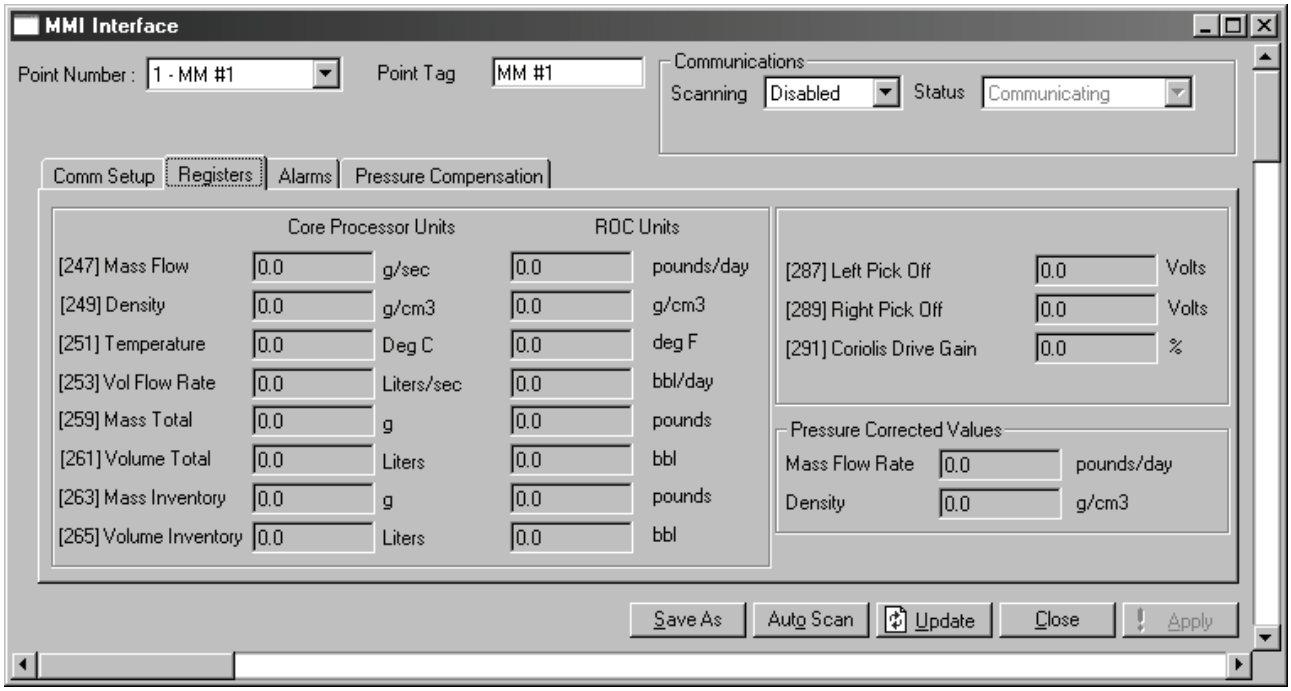


Table 4-6 MMI Interface parameters – Registers panel

Parameter	Description	Comments
Mass Flow	Mass flow rate as retrieved from sensor	
Density	Process density value as retrieved from sensor	
Temperature	Process temperature as retrieved from sensor	
Vol Flow Rate	Volume flow rate as retrieved from sensor	
Mass Total	Mass total as measured by core processor	Total since last reset of totalizer in core processor
Volume Total	Volume total as measured by core processor	Total since last reset of totalizer in core processor

Table 4-6 **MMI Interface parameters – Registers panel** *continued*

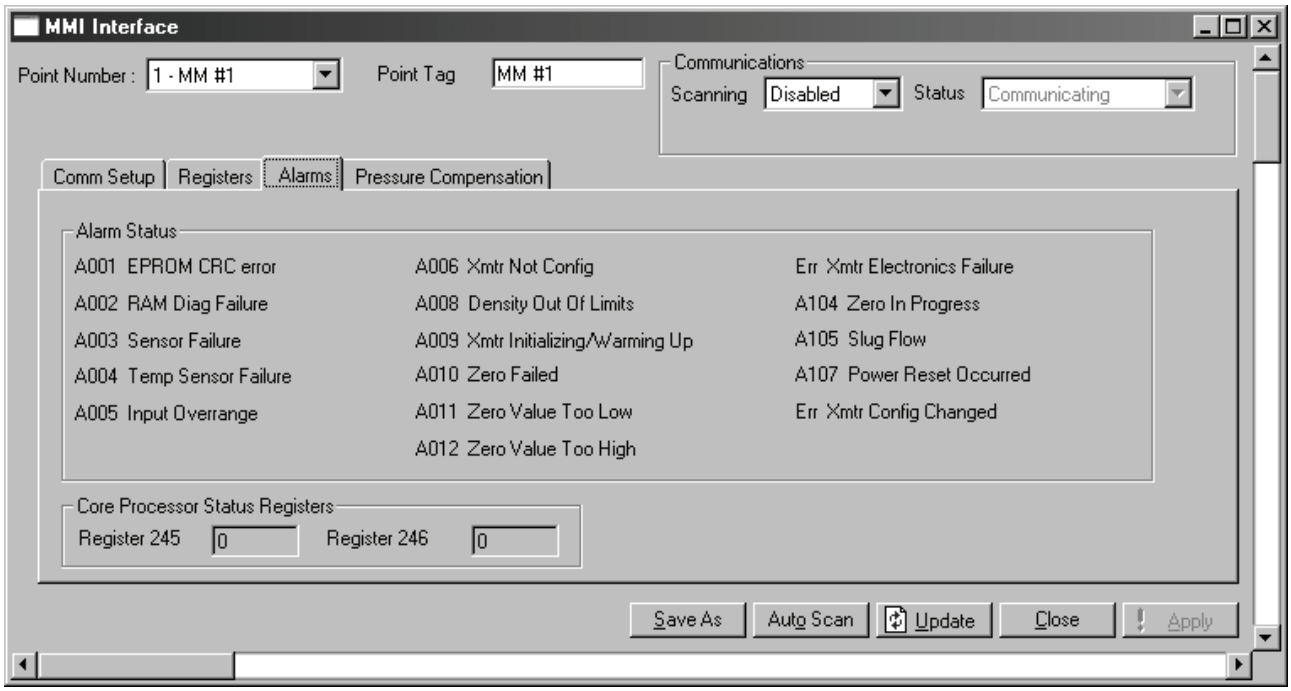
Parameter	Description	Comments
Mass Inventory	Mass inventory as measured by core processor	Total since last reset of inventory in core processor
Volume Inventory	Volume inventory as measured by core processor	Total since last reset of inventory in core processor
Left Pickoff	Voltage at sensor's left pickoff	
Right Pickoff	Voltage at sensor's right pickoff	
Coriolis Drive Gain	A measure of the sensor's ability to vibrate freely	Used in troubleshooting and transient bubble remediation
Pressure Compensated Values		
Mass Flow Rate	Mass flow rate from the sensor, compensated for pressure	Pressure compensation must be enabled. See Section 5.5.
Density	Process density from the sensor, compensated for pressure	Pressure compensation must be enabled. See Section 5.5.

4.3.3 MMI Interface display – Alarms panel

The MMI Interface Alarms panel (see Figure 4-10) displays all currently active alarms reported by the Micro Motion sensor associated with this MMI Interface.

Note: This is not a list of all active alarms. For more information on alarms, see the manual entitled ROCLINK 800 Configuration Software: User Manual.

Figure 4-10 **MMI Interface display – Alarms panel**



4.3.4 MMI Interface display – Pressure Compensation panel

The MMI Interface Pressure Compensation panel is used to configure pressure compensation for mass or density values from the associated sensor. See Figure 4-11 and Table 4-7.

Figure 4-11 MMI Interface display – Pressure Compensation panel

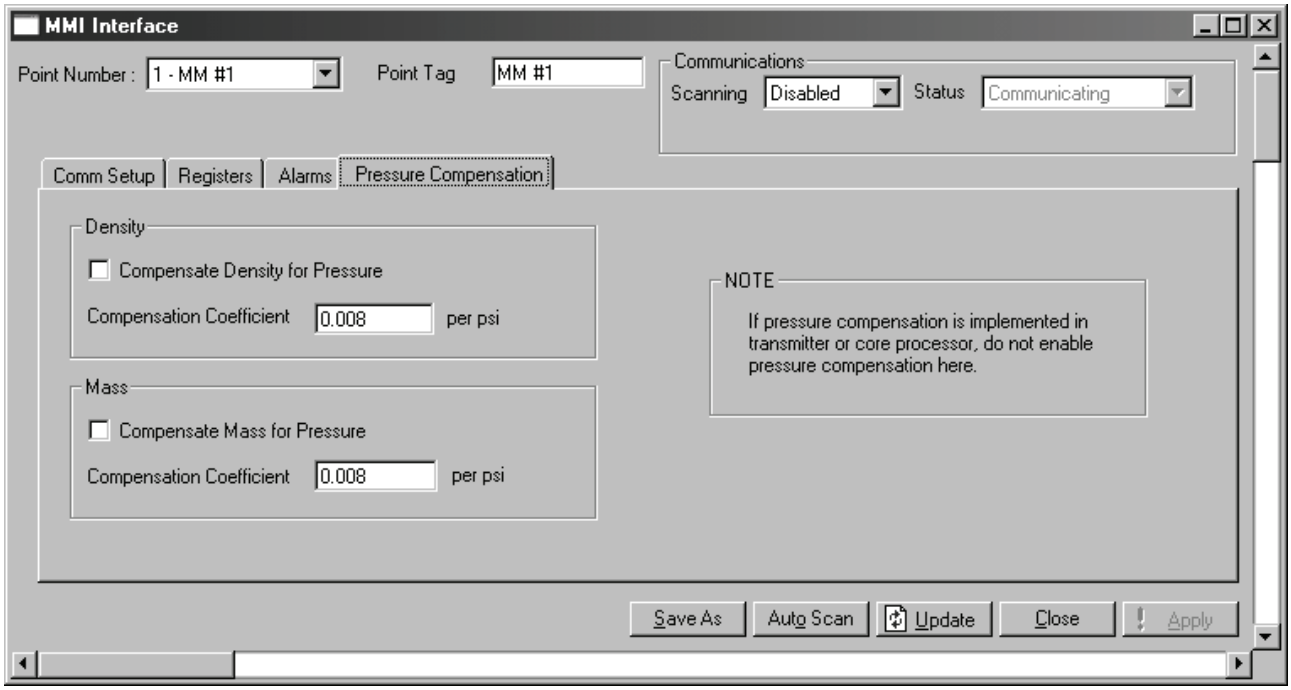


Table 4-7 MMI Interface parameters – Pressure Compensation panel

Parameter	Description	Comments
Density		
Compensate Density for Pressure	• Enabled: Pressure compensation will be applied to density values before NOC calculations are performed • Disabled: Pressure compensation will not be applied to density values before NOC calculations are performed	See Sections 2.10 and 5.5
Compensation Coefficient	Specifies the factor to be used for pressure compensation of density data	See Section 2.10
Mass		
Compensate Mass for Pressure	• Enabled: Pressure compensation will be applied to mass values before NOC calculations are performed • Disabled: Pressure compensation will not be applied to mass values before NOC calculations are performed	See Sections 2.10 and 5.5
Compensation Coefficient	Specifies the factor to be used for pressure compensation of mass data	See Section 2.10

4.4 NOC Meter display

The NOC Meter display includes eight panels:

- General – see Section 4.4.1
- Inputs – see Section 4.4.2
- TBR – see Section 4.4.3
- Instant Values – see Section 4.4.4
- Totals – see Section 4.4.5
- Averages – see Section 4.4.6
- Alarms – see Section 4.4.7
- Density Determination – see Section 4.4.8

4.4.1 NOC Meter display – General panel

The NOC Meter General panel is used to configure the water cut setpoint and enable or disable alarms for the selected NOC Meter. See Figure 4-12 and Table 4-8.

Figure 4-12 NOC Meter display – General panel

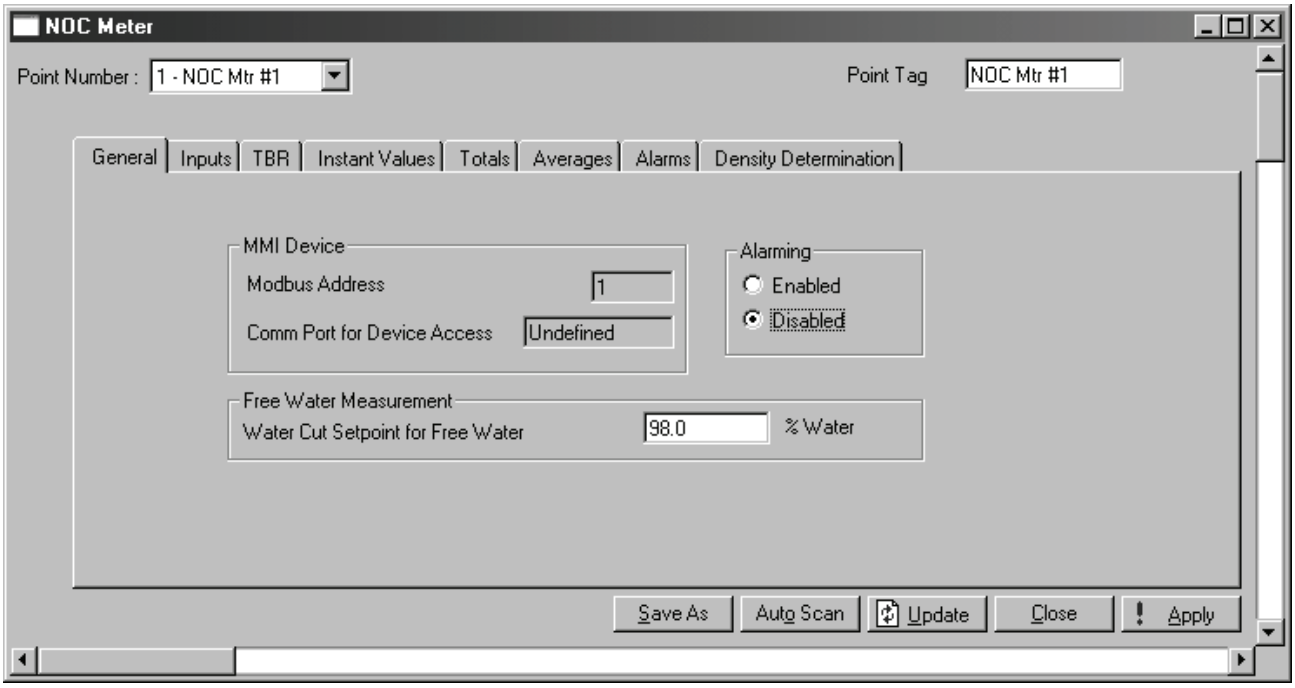


Table 4-8 NOC Meter parameters – General panel

Parameter	Description	Comments
Point Number	The number of the currently selected NOC Meter. Use the dropdown list to select the NOC Meter you want to use.	
Point Tag	The name of the currently selected NOC Meter.	

Table 4-8 NOC Meter parameters – General panel *continued*

Parameter	Description	Comments
MMI Device	*Displays information about the Micro Motion sensor associated with this NOC Meter*	
Modbus Address	The Modbus address of the core processor on the associated sensor	Read-only. The Modbus Address is configured on the MMI Interface display, Comm Setup panel (see Section 4.3.1).
Comm Port for Device Access	The ID of the ROC809 comm port that is used to connect to Micro Motion sensors.	Read-only. The Comm Port for Device Access is configured on the MMI Interface display, Comm Setup panel (see Section 4.3.1).
Alarming	• Enabled: Flow alarms and sensor alarms are displayed on the Alarms panel, and SRBX alarming is available for configuration. • Disabled: Flow alarms and sensor alarms are not displayed on the Alarms panel, and SRBX alarming cannot be configured or used for flow alarms.	
Water Cut Setpoint for Free Water	The water cut value used to define free water. If the applied water cut is equal to or greater than this value, the process fluid is considered to be free water. • If the Micro Motion sensor associated with this NOC Meter is installed on the water leg, enter 0. • If the Micro Motion sensor associated with this NOC Meter is installed on the liquid leg, enter a non-zero value.	See Section 2.7

4.4.2 NOC Meter display – Inputs panel

The NOC Meter Inputs panel is used to identify the source of process data used in NOC measurement, and to configure how water cut will be determined. See Figure 4-13 and Table 4-9.

Figure 4-13 NOC Meter display – Inputs panel

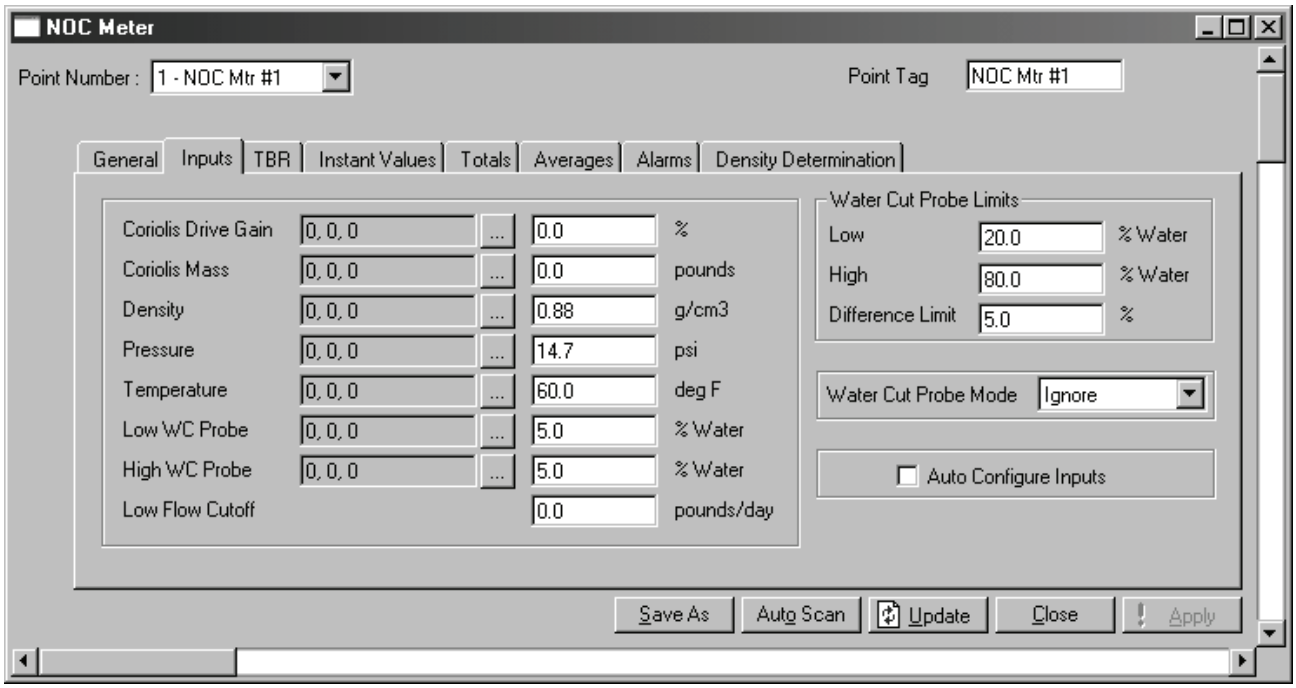


Table 4-9 NOC Meter parameters – Inputs panel

Parameter	Description	Comments
Auto Configure Inputs	• Checked: The following TLP assignments are automatically made: - Coriolis Drive Gain = **UDP71 [1/2/3], R291** - Coriolis Mass = **UDP71 [1/2/3], R259CU** - Density = **UDP71 [1/2/3], R249CU** - Temperature = **UDP71 [1/2/3], R251CU** • Unchecked: No inputs are configured automatically	If auto-configuration is used, inputs will reference the Micro Motion sensor associated with this NOC Meter. The checkbox is automatically cleared after auto-configuration has been performed.
Coriolis Drive Gain	The point from which to read the sensor drive gain. This must be a Micro Motion sensor value (TLP: **UDP71 [1/2/3], R291**).	See Section 2.11
Coriolis Mass	The point from which to read the mass total value.	Typically, the mass total value from a Micro Motion sensor is used.
Density	The point from which to read the density value.	Typically, the density value from a Micro Motion sensor is used.
Pressure	The point from which to read the static pressure value.	Static pressure is typically read from an analog input connected to a pressure sensor (TLP example: **AIN 4-1, EU**). However, an FST may be used to write a pressure value to an FST register or a soft point.
Temperature	The point from which to read the temperature value. Specify either: • The temperature value from a Micro Motion sensor • The EU value from an RTD input	
Low WC Probe	The point from which to read the value from the water cut probe used to monitor low water cut	
High WC Probe	The point from which to read the value from the water cut probe used to monitor high water cut	
Low Flow Cutoff	The flow rate below which the flow rate will be reported as 0. If the flow rate goes below this value: • 0 will be used in NOC calculations. • A No Flow alarm will be posted for this NOC Meter.	No Flow alarms are displayed on the NOC Station Alarms panel (see Section 4.2.6) and on the appropriate NOC Meter Alarms panel (see Section 4.4.7).
Water Cut Probe Limits		
Low	A water cut value, in % of water. If the calculated water cut value is below the Low Water Monitor Limit, the value reported by the low water cut probe is considered for use in NOC measurement and reporting.	See Section 2.7
High	A water cut value, in % of water. If the calculated water cut value is above the High Water Monitor Limit, the value reported by the high water cut probe is considered for use in NOC measurement and reporting.	See Section 2.7
Difference Limit	Defines the discrepancy between the density-based water cut value and the water cut value measured by probes at which the Net Oil Computer Software will consider using the water cut source	See Section 2.7
Water Cut Probe Mode	• Ignore: Water cut probes are ignored and the density-based water cut is always used. • Auto: The Net Oil Computer Software selects the water cut source to use based on the configured water cut probe limits, the configured difference limit, and the current water cut values from both sources	See Section 2.7

4.4.3 NOC Meter display – TBR panel

The NOC Meter TBR panel is used to configure transient bubble remediation. See Figure 4-14 and Table 4-10.

Figure 4-14 NOC Meter display – TBR panel

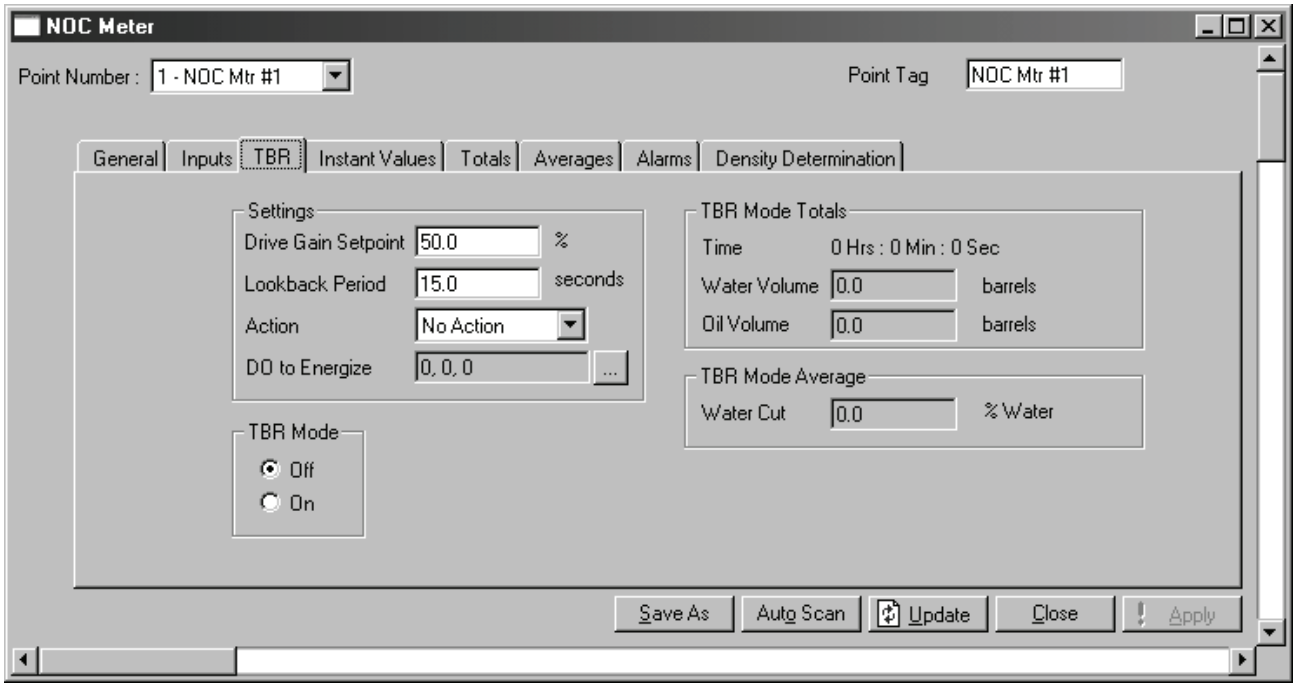


Table 4-10 NOC Meter parameters – TBR panel

Parameter	Description	Comments
Settings		
Drive Gain Setpoint	The drive gain threshold (in %) above which TBR will be applied.	The drive gain must exceed this value for three seconds before TBR is applied.
Lookback Period	The number of seconds to go back in time to retrieve the density value to be used in NOC calculations if the Correct Density action is specified.	Default: 15 seconds Range: 5–30 seconds
Action	The action(s) that this NOC Meter will perform if a transient bubble condition is detected: • No Action: This NOC Meter will not take any action. Measurement will continue normally. • Correct Density: This NOC Meter will use the density value as measured at a previous point. This point is determined by the Time parameter. • Log Alarm: The Net Oil Computer Software will write an alarm to the alarm log. • Energize DO: The Net Oil Computer Software will activate the discrete output specified below. • All: The system will simultaneously correct the density reading, log an alarm, and energize the configured discrete output.	
DO to Energize	Use the Select TLP dialog box to specify the discrete output that will be activated if a transient bubble condition is detected (TLP example: **DOU 3-1, TAG**).	Used only if the selected Action is Energize DO or All.

Table 4-10 NOC Meter parameters – TBR panel *continued*

Parameter	Description	Comments
TBR Mode	• Off: TBR is not enabled. This NOC Meter will not attempt to detect transient bubble conditions. • On: TBR is enabled. This NOC Meter will detect transient bubble conditions and take the actions specified above.	
TBR Mode Totals	*All values represent only data from intervals when a transient bubble condition was determined to exist. Data is summed across all transient bubble intervals in the current period:* *• In Continuous mode, the current period runs from the most recent contract hour to the present moment.* *• In Well Test mode, the current period runs from the beginning of the well test to the present moment.*	
Time	The total hours, minutes, and seconds that transient bubble conditions have been detected by this NOC Meter.	
Water Volume	The total quantity of water that has been measured by this NOC Meter during transient bubble intervals in the current period.	
Oil Volume	The total quantity of oil that has been measured by this NOC Meter during transient bubble intervals in the current period.	
TBR Mode Averages	*All values represent only data from intervals when a transient bubble condition was determined to exist. Data is averaged across all transient bubble intervals in the current period:* *• In Continuous mode, the current period runs from the most recent contract hour to the present moment.* *• In Well Test mode, the current period runs from the beginning of the well test to the present moment.*	
Water Cut	The average water cut applied by this NOC Meter during transient bubble intervals in the current period	See Section 2.7

4.4.4 NOC Meter display – Instant Values panel

The NOC Meter Instant Values panel displays current NOC data from this NOC Meter. See Figure 4-15 and Table 4-11.

Figure 4-15 NOC Meter display – Instant Values panel

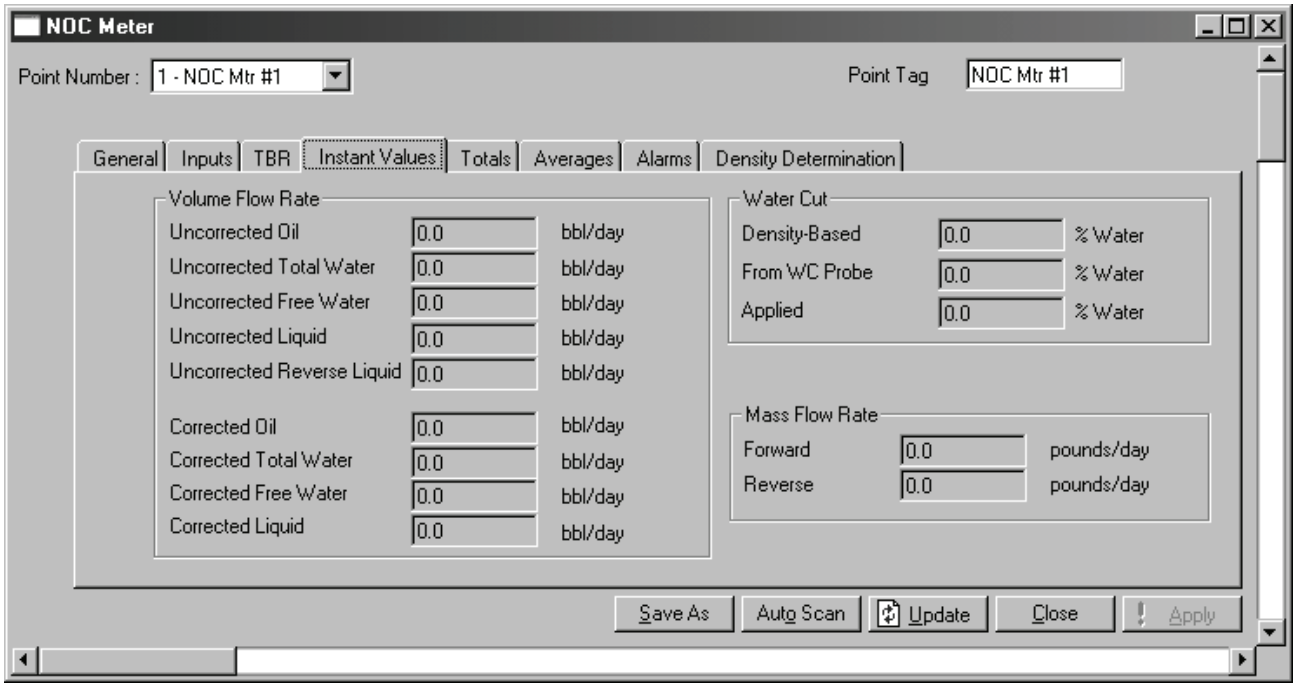


Table 4-11 NOC Meter parameters – Instant Values panel

Parameter	Description	Comments
Volume Flow Rate		
Uncorrected Oil	The current volume flow rate of oil through the associated Micro Motion sensor, not corrected for temperature or pressure	
Uncorrected Total Water	The current volume flow rate of total water through the associated Micro Motion sensor, not corrected for temperature or pressure	
Uncorrected Free Water	The current volume flow rate of free water through the associated Micro Motion sensor, not corrected for temperature or pressure	
Uncorrected Liquid	The current volume flow rate, forward flow only, of liquid through the associated Micro Motion sensor, not corrected for temperature or pressure	
Uncorrected Reverse Liquid	The current volume flow rate, reverse flow only, of liquid through the associated Micro Motion sensor, not corrected for temperature or pressure	
Corrected Oil	The current volume flow rate of oil through the associated Micro Motion sensor, corrected for temperature and pressure	
Corrected Total Water	The current volume flow rate of total water through the associated Micro Motion sensor, corrected for temperature and pressure	

Table 4-11 NOC Meter parameters – Instant Values panel *continued*

Parameter	Description	Comments
Corrected Free Water	The current volume flow rate of free water through the associated Micro Motion sensor, corrected for temperature and pressure	
Corrected Liquid	The current volume flow rate of liquid through the associated Micro Motion sensor, corrected for temperature and pressure	
Water Cut		
Density-Based	The current water cut value for the process stream through the associated Micro Motion sensor, as derived from density data using NOC equations	See Section 2.7
From WC Probe	The current water cut value for the process stream through the associated Micro Motion sensor, as measured by the water cut probe	See Section 2.7
Applied	The water cut currently used in NOC measurement	See Section 2.7
Mass Flow Rate		
Forward	Mass flow rate, forward flow only, of liquid through the associated Micro Motion sensor	
Reverse	Mass flow rate, reverse flow only, of liquid through the associated Micro Motion sensor	

4.4.5 NOC Meter display – Totals panel

The NOC Meter Totals panel (see Figure 4-16 and Table 4-12) displays current NOC totals for this NOC Meter. Data is totaled for the current period:

- In Continuous mode, the current period runs from the most recent contract hour to the present moment.
- In Well Test mode, the current period runs from the beginning of the well test to the present moment.

Figure 4-16 NOC Meter display – Totals panel

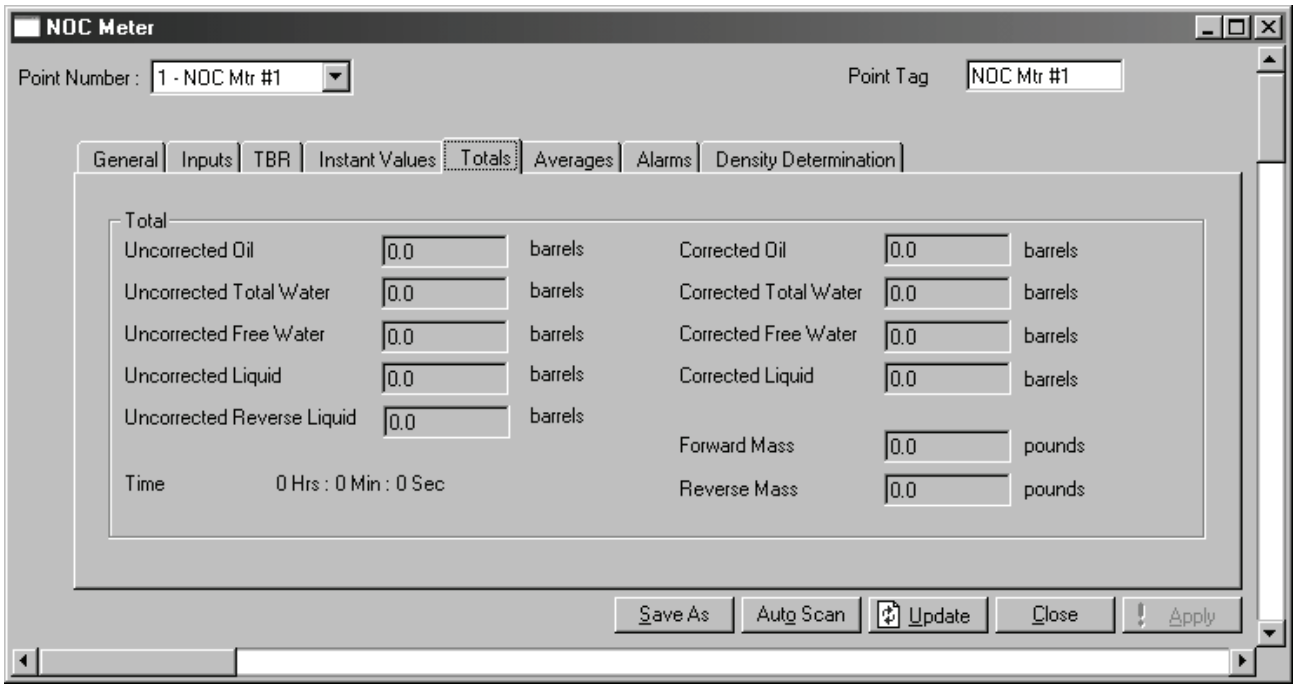


Table 4-12 NOC Meter parameters – Totals panel

Parameter	Description	Comments
Uncorrected Oil	The amount of oil through the associated Micro Motion sensor for the current period, not corrected for temperature or pressure	
Total Water	The amount of total water through the associated Micro Motion sensor for the current period, not corrected for temperature or pressure	
Free Water	The amount of free water through the associated Micro Motion sensor for the current period, not corrected for temperature or pressure	
Uncorrected Liquid	The amount of liquid through the associated Micro Motion sensor for the current period, not corrected for temperature or pressure	
Time	Time elapsed since totalizers were last reset	Refers to totalizers in the Net Oil Computer Software, not totalizers in the core processor.
Corrected Oil	The amount of oil through the associated Micro Motion sensor for the current period, corrected for temperature and pressure	
Corrected Total Water	The amount of total water through the associated Micro Motion sensor for the current period, corrected for temperature and pressure	
Corrected Free Water	The amount of free water through the associated Micro Motion sensor for the current period, corrected for temperature and pressure	

Table 4-12 **NOC Meter parameters – Totals panel** *continued*

Parameter	Description	Comments
Corrected Liquid	The amount of liquid through the associated Micro Motion sensor for the current period, corrected for temperature and pressure	
Forward Mass	The amount of mass, forward flow only, through the associated Micro Motion sensor for the current period	
Reverse Mass	The amount of mass, reverse flow only, through the associated Micro Motion sensor for the current period	

4.4.6 NOC Meter display – Averages panel

The NOC Meter Averages panel (see Figure 4-17 and Table 4-13) displays current NOC totals for this NOC Meter. Data is averaged for the current period:

- In Continuous mode, the current period runs from the most recent contract hour to the present moment.
- In Well Test mode, the current period runs from the beginning of the well test to the present moment.

Figure 4-17 **NOC Meter display – Averages panel**

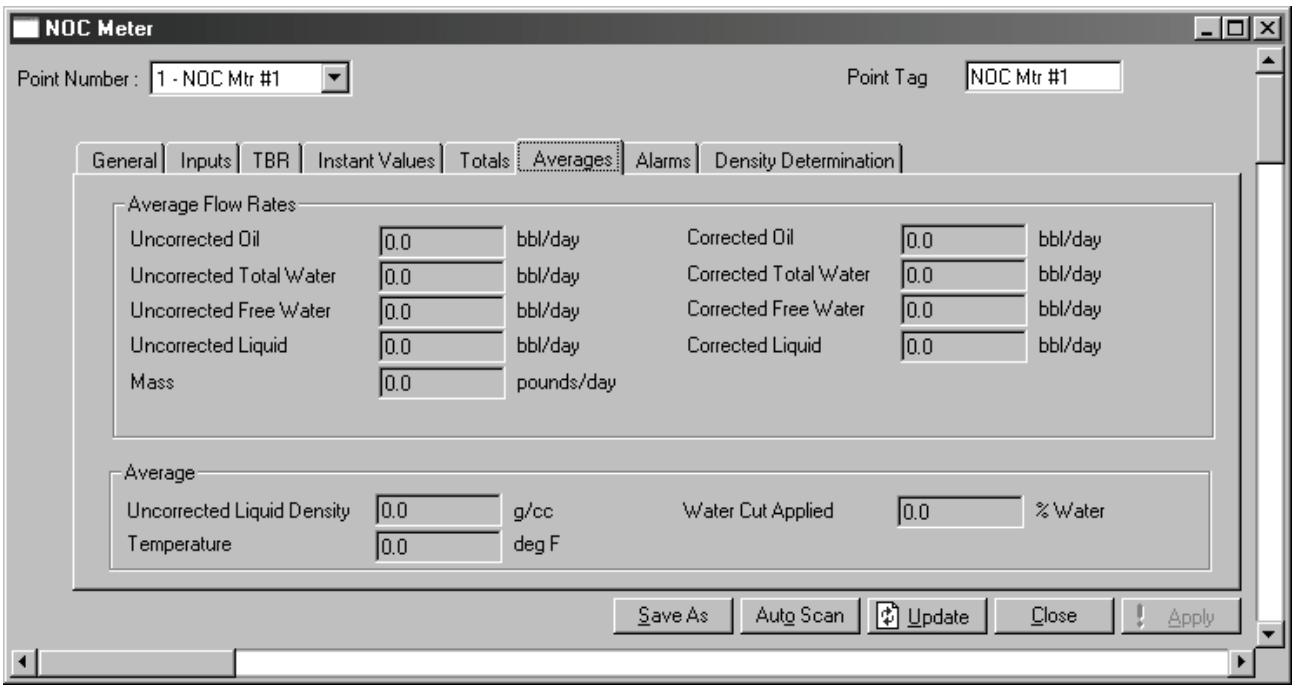


Table 4-13 NOC Meter parameters – Averages panel

Parameter	Description	Comments
Average Flow Rates	*All average values in this section are flow-weighted.*	
Uncorrected Oil	Average volume flow rate of oil for the current period, not corrected for temperature or pressure	
Uncorrected Total Water	Average volume flow rate of all water for the current period, not corrected for temperature or pressure	
Uncorrected Free Water	Average volume flow rate of free water for the current period, not corrected for temperature or pressure	
Uncorrected Liquid	Total volume flow rate of all process fluid for the current period, not corrected for temperature or pressure	
Mass	Average mass flow rate of all process fluid for the current period	
Corrected Oil	Average volume flow rate of oil for the current period, corrected for temperature and pressure	
Corrected Total Water	Average volume flow rate of all water for the current period, corrected for temperature and pressure	
Corrected Free Water	Average volume flow rate of free water for the current period, corrected for temperature and pressure	
Corrected Liquid	Average volume flow rate of all process fluid for the current period, corrected for temperature and pressure	
Average	*All average values in this section are flow-weighted.*	
Uncorrected Liquid Density	Average density of liquid for the current period, uncorrected for temperature or pressure	
Temperature	Average temperature of all process fluid	
Water Cut Applied	The average water cut used in NOC calculations during the current period	See Section 2.7

4.4.7 NOC Meter display – Alarms panel

The NOC Meter Alarms panel (see Figure 4-18 and Table 4-14) displays active alarms for this NOC Meter, in the following alarm categories:

- No Flow alarms, as defined by the Low Flow Cutoff value configured on the NOC Meter Inputs panel (see Section 4.4.2)
- Low Flow and High Flow alarms, as defined in the Alarms fields on this panel
- Coriolis alarms – alarms posted by the Micro Motion sensor associated with the NOC Meter
- No Communications alarms, indicating that this NOC Meter is not receiving data from the associated Micro Motion sensor

This panel is also used to configure settings for Low Flow and High Flow alarms, and to configure alarm reporting for flow alarms.

Figure 4-18 **NOC Meter display – Alarms panel**

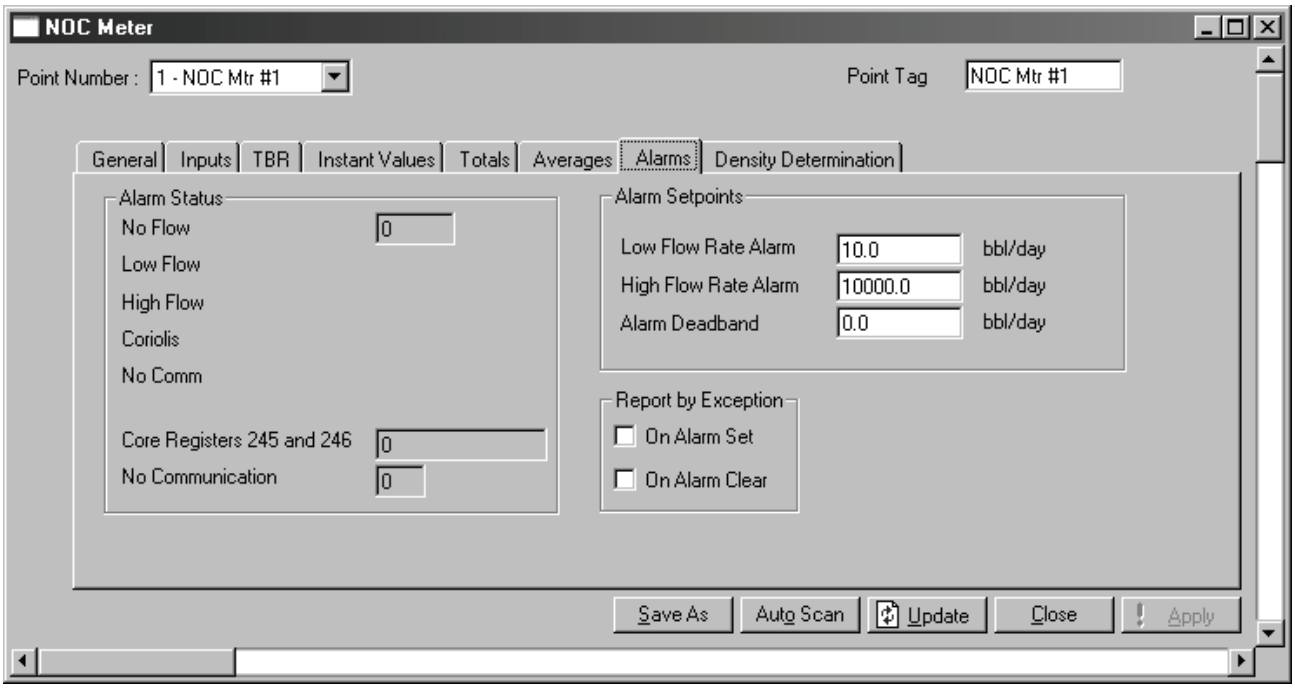


Table 4-14 **NOC Meter parameters – Alarms panel**

Parameter	Description	Comments
Alarm Status	*These fields appear only if alarming is enabled on the General panel (see Figure 4-12).*	
No Flow	Indicates No Flow alarm status: • A blank field represents an inactive alarm state. • A red bar represents an active alarm state.	As defined by the Low Flow Cutoff value configured on the NOC Meter Inputs panel (see Section 4.4.2)
Low Flow	Indicates Low Flow alarm status: • A blank field represents an inactive alarm state. • A red bar represents an active alarm state.	As defined by the Low Flow Rate Alarm parameter on this panel
High Flow	Indicates High Flow alarm status: • A blank field represents an inactive alarm state. • A red bar represents an active alarm state.	As defined by the High Flow Rate Alarm parameter on this panel
Coriolis	Indicates that the associated Micro Motion sensor is reporting an alarm condition	Micro Motion sensor alarms are displayed on the MMI Interface Alarms panel (see Section 4.3.3).
No Comm	Indicates that this NOC Meter is unable to communicate with the associated Micro Motion sensor	
Core Registers 245 and 256	Displays the internal value of the core processor status registers 245 and 246	Read-only
No Communication	Displays the internal value of the active Micro Motion communications alarm	Read-only

Table 4-14 NOC Meter parameters – Alarms panel *continued*

Parameter	Description	Comments
Alarm Setpoints		
Low Flow Rate Alarm	Specify the value at which a low flow rate alarm will be posted. The alarm will be posted if the instantaneous flow rate meets or drops below this value.	If pressure compensation is enabled, the alarm is based on the compensated flow rate.
High Flow Rate Alarm	Specify the value at which a high flow rate alarm will be posted. The alarm will be posted if the instantaneous flow rate meets or exceeds this value.	If pressure compensation is enabled, the alarm is based on the compensated flow rate.
Alarm Deadband	Specify the size of two inactive zones: one below the low flow rate alarm limit and one above the high flow rate alarm limit.	Prevents recurrent setting and clearing of alarm when the input value is oscillating around the alarm limit. Also prevents filling the alarm log with repetitive data.
Report by Exception	*These fields appear only if alarming is enabled on the General panel (see Figure 4-12).*	
On Alarm Set	• Enabled – An RBX alarm will be generated when flow enters an alarm condition • Disabled – An RBX alarm will not generated when flow enters an alarm condition	If either of these options is enabled, a communications port must be configured for SRBX alarming. See the manual entitled *ROCLINK 800 Configuration Software: User Manual*.
On Alarm Clear	• Enabled – An RBX alarm will be generated when the flow alarm condition clears • Disabled – An RBX alarm will not generated when the flow alarm condition clears	

4.4.8 NOC Meter display – Density Determination panel

The NOC Meter Density Determination panel (see Figure 4-19 and Table 4-15) is used to perform density determination routines for oil or water.

Figure 4-19 NOC Meter display – Density Determination panel

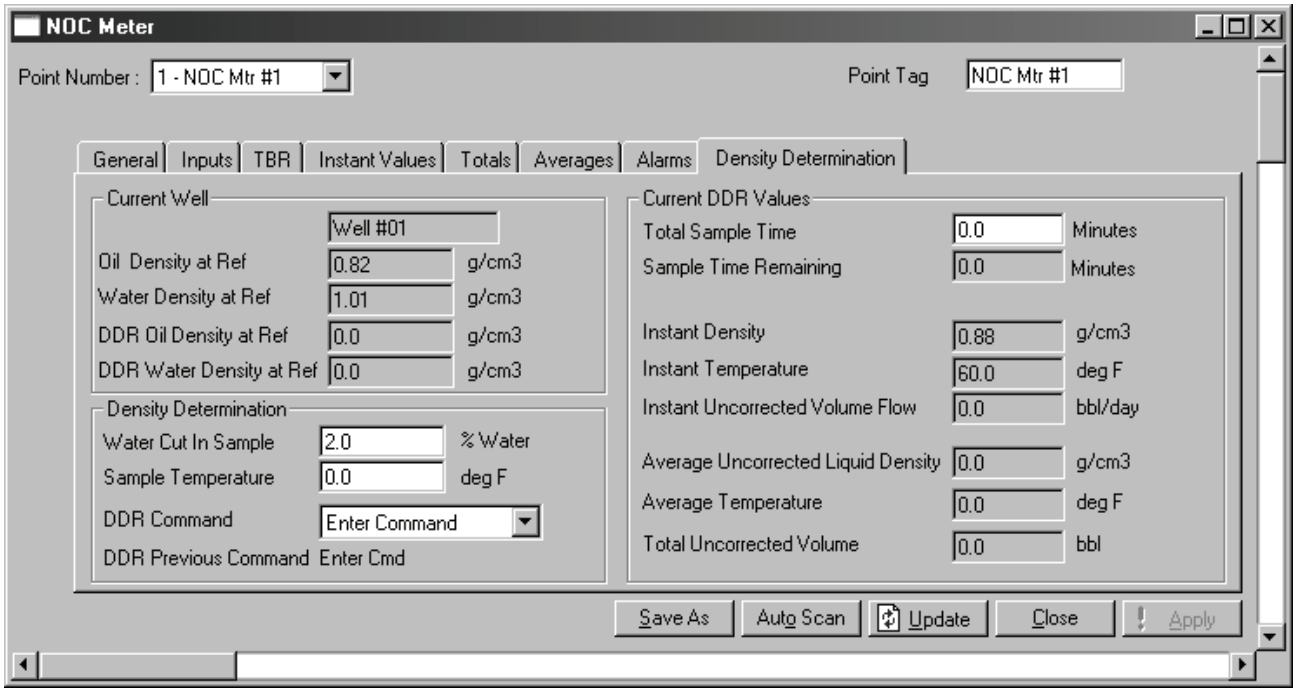


Table 4-15 NOC Meter parameters – Density Determination panel

Parameter	Description	Comments
Current Well		
Oil Density at Ref	Displays the value currently configured for the selected well	Read-only; see Section 4.5.1
Water Density at Ref	Displays the value currently configured for the selected well	Read-only; see Section 4.5.1
DDR Oil Density at Ref	Displays the value generated by the density determination routine	Read only; will be 0.0 until a density determination procedure for oil has been performed
DDR Water Density at Ref	Displays the value generated by the density determination routine	Read only; will be 0.0 until a density determination procedure for oil has been performed
Density Determination		
Water Cut In Sample	Amount of water in oil sample, as determined by external procedure. Enter as percent.	Used only during oil density determination
Sample Temperature	Temperature of the oil sample when the water cut was determined. Enter in configured temperature units.	Used only during oil density determination
DDR Command	Select density determination command to be executed, then click Apply.	
DDR Previous Command	Displays previous density determination command	Read-only
Current DDR Values		
Total Sample Time	Number of minutes over which values will be averaged for density determination	Default: 1.0 minute In general, longer values yield better results.
Sample Time Remaining	Number of minutes remaining in the test period	Read-only
Instant Density	Current density of the process fluid	
Instant Temperature	Current temperature of the process fluid	
Instant Uncorrected Volume Flow	Current volume flow rate of the process fluid, uncorrected for temperature or pressure	
Average Uncorrected Liquid Density	Average density of the process fluid, uncorrected for temperature or pressure	Averaged from the time the density determination routine was started to the present moment
Average Temperature	Average temperature of the process fluid	
Total Uncorrected Volume	Total volume of either oil or water (depending on the density determination routine being performed), uncorrected for temperature or pressure	Totaled from the time the density determination routine was started to the present moment

4.5 Well Data display

The Well Data display includes two panels:

- Configuration – see Section 4.5.1
- History – see Section 4.5.2

Both panels vary slightly depending on the configured Operation Mode.

4.5.1 Well Data display – Configuration panel

The Well Data Configuration panel (see Figure 4-20 and Table 4-16) is used to specify reference and other values for the selected well.

Figure 4-20 Well Data display – Configuration panel

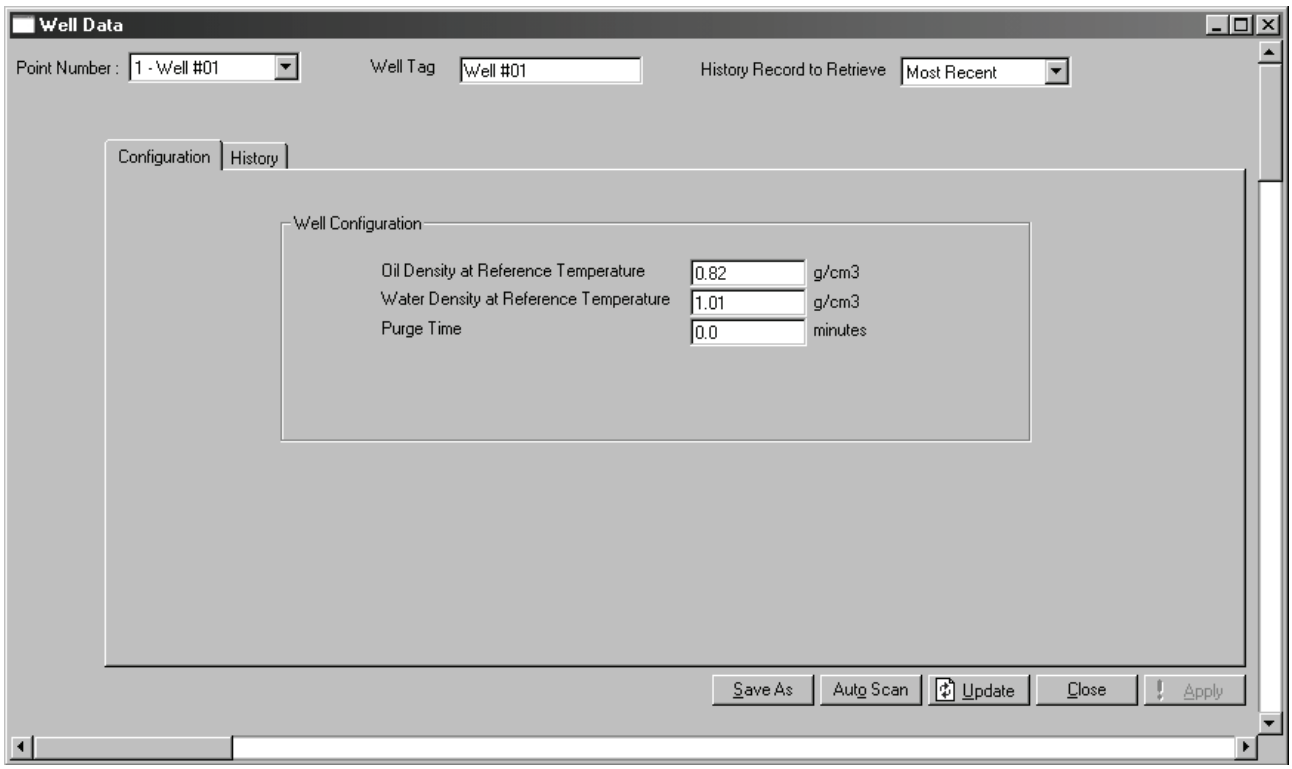


Table 4-16 Well Data parameters – Configuration panel

Parameter	Description	Comments
Point Number	(Operation Mode = Well Test) The number of the currently selected well. Use the dropdown list to select a different well. (Operation Mode = Continuous) The name of the currently selected contract period. Use the dropdown list to select a different contract period.	
Well Tag	(Operation Mode = Well Test) The name assigned to this well	
History Record to Retrieve	(Operation Mode = Well Test) The six most recent well tests can be retrieved for viewing. Use the dropdown list to select the desired well test.	

Table 4-16 Well Data parameters – Configuration panel *continued*

Parameter	Description	Comments
Station Record to Retrieve	(Operation Mode = Continuous) Use the dropdown list to view data from the NOC Station (summed across NOC Meters) or data from a specific meter.	
Oil Density at Reference Temperature	The density of live oil from this well at the configured Reference Temperature (see Table 4-1).	
Water Density at Reference Temperature	The density of the water from this well at the configured Reference Temperature (see Table 4-1).	
Purge Time	(Operation Mode = Well Test) The number of minutes required to clear well test fluids from the separator.	When a well test is initiated, the Net Oil Computer Software waits for the period specified here before recording test data. Totals remain constant throughout the purge, and increase as the well test begins. Micro Motion recommends that purge time be calculated as follows: $\frac{2 \times \text{LiquidVolumeOfSeparator}}{\text{AverageFlowRateOfWell}}$

4.5.2 Well Data display – History panel

The Well Data History panel (see Figure 4-21 and Table 4-17) displays Initial and Recalculated values for many fields:

- Initial values are the values measured or calculated during the selected well test or during the selected measurement period.
- Recalculated values are the values generated by a recalculation procedure (see Section 2.13 and Section 8.7). If no recalculation has been performed on the selected data set, the Recalculated fields display zeros.

For Total and Average values:

- In Well Test mode, the values represent data from the selected well test.
- In Continuous mode, the values represent data from the selected contract period and either the NOC Station or the selected NOC Meter.

Figure 4-21 Well Data display – History panel

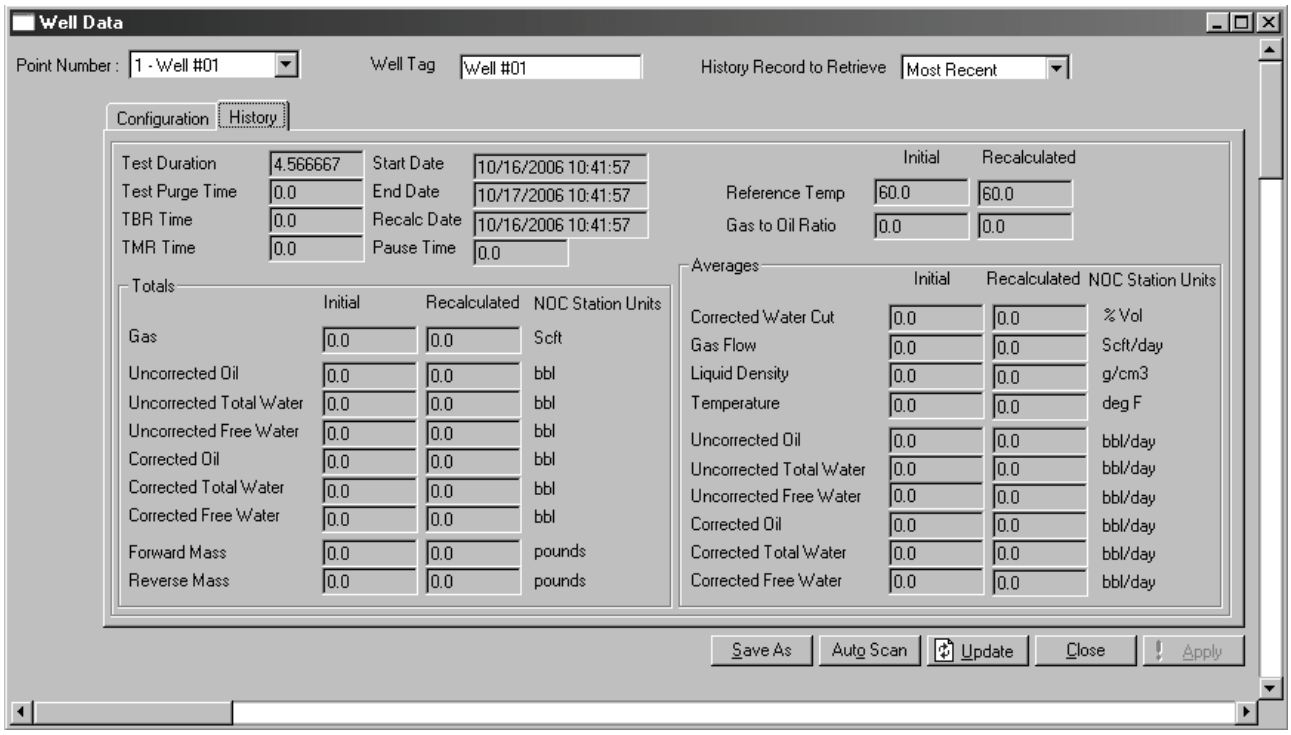

Well Data
Point Number : 1 - Well #01
Well Tag Well #01
History Record to Retrieve Most Recent
Configuration History
Test Duration 4.566667
Test Purge Time 0.0
TBR Time 0.0
TMR Time 0.0
Start Date 10/16/2006 10:41:57
End Date 10/17/2006 10:41:57
Recalc Date 10/16/2006 10:41:57
Pause Time 0.0
Initial Recalculated
Reference Temp 60.0 60.0
Gas to Oil Ratio 0.0 0.0
Totals
Initial Recalculated NOC Station Units
Gas 0.0 0.0 Scft
Uncorrected Oil 0.0 0.0 bbl
Uncorrected Total Water 0.0 0.0 bbl
Uncorrected Free Water 0.0 0.0 bbl
Corrected Oil 0.0 0.0 bbl
Corrected Total Water 0.0 0.0 bbl
Corrected Free Water 0.0 0.0 bbl
Forward Mass 0.0 0.0 pounds
Reverse Mass 0.0 0.0 pounds
Averages
Initial Recalculated NOC Station Units
Corrected Water Cut 0.0 0.0 % Vol
Gas Flow 0.0 0.0 Scft/day
Liquid Density 0.0 0.0 g/cm3
Temperature 0.0 0.0 deg F
Uncorrected Oil 0.0 0.0 bbl/day
Uncorrected Total Water 0.0 0.0 bbl/day
Uncorrected Free Water 0.0 0.0 bbl/day
Corrected Oil 0.0 0.0 bbl/day
Corrected Total Water 0.0 0.0 bbl/day
Corrected Free Water 0.0 0.0 bbl/day
Save As
Auto Scan
Update
Close
Apply

Table 4-17 Well Data parameters – History panel

Parameter	Description	Comments
Point Number	(Operation Mode = Well Test) The number of the currently selected well. Use the dropdown list to select a different well. (Operation Mode = Continuous) The name of the currently selected contract period. Use the dropdown list to select a different contract period.	
History Record to Retrieve	(Operation Mode = Well Test) The six most recent well tests can be retrieved for viewing. Use the dropdown list to select the desired well test.	
Station Record to Retrieve	(Operation Mode = Continuous) Use the dropdown list to view data from the NOC Station (summed across NOC Meters) or data from a specific meter.	
Test Duration	(Operation Mode = Well Test) The hours and minutes that the selected well test was active, including paused time and transient bubble intervals (Operation Mode = Continuous) The hours and minutes that Continuous Mode has been active, including transient bubble intervals	
Test Purge Time	(Operation Mode = Well Test only) The hours and minutes spent in purge time during the selected well test	
Start Date	(Operation Mode = Well Test) The date and time that the selected well test was initiated (Operation Mode = Continuous) The beginning timestamp for this contract period.	

Table 4-17 Well Data parameters – History panel *continued*

Parameter	Description	Comments
End Date	(Operation Mode = Well Test) The date and time that the selected well test was stopped. (Operation Mode = Continuous) The ending timestamp for this contract period	
Recalc Date	The date and time that the displayed recalculation was performed	
Pause Time	(Operation Mode = Well Test) The total duration, in hours and minutes, of all pause time during the selected well test	
Reference Temperature	The temperature to which density and volume measurements are corrected during NOC calculation	
Gas to Oil Ratio	The Gas to Oil Ratio of the process fluid	
Totals		
Gas	The total gas measured by the gas sensor	
Uncorrected Oil	The amount of oil measured by the NOC system, uncorrected for temperature or pressure	
Uncorrected Total Water	The amount of total water measured by the NOC system, uncorrected for temperature or pressure	
Uncorrected Free Water	The amount of free water measured by the NOC system, uncorrected for temperature or pressure	
Corrected Oil	The amount of oil measured by the NOC system, corrected for temperature and pressure	
Corrected Total Water	The amount of total water measured by the NOC system, corrected for temperature and pressure	
Corrected Free Water	The amount of free water measured by the NOC system, corrected for temperature and pressure	
Forward Mass	The amount of mass measured by the NOC system, forward flow only	
Reverse Mass	The amount of mass measured by the NOC system, reverse flow only	
Averages	*All average values in this section are flow-weighted.*	
Corrected Water Cut	The average water cut during the well test or measurement period	
Gas Flow	The average flow rate of gas	
Liquid density	The average density of liquid	
Temperature	The average temperature	
Uncorrected Oil	The average flow rate of oil, uncorrected for temperature or pressure	
Uncorrected Total Water	The average flow rate of total water, uncorrected for temperature or pressure	
Uncorrected Free Water	The average flow rate of free water, uncorrected for temperature or pressure	
Corrected Oil	The average flow rate of oil, corrected for temperature and pressure	
Corrected Total Water	The average flow rate of total water, corrected for temperature and pressure	
Corrected Free Water	The average flow rate of free water, corrected for temperature and pressure	

4.6 NOC Recalc display

The NOC Recalc display includes four panels:

- General – see Section 4.6.1
- Totals – see Section 4.6.2
- Averages – see Section 4.6.3
- Recalculable Tests – see Section 4.6.4

4.6.1 NOC Recalc display – General panel

The NOC Recalc General panel (see Figure 4-22 and Table 4-18) is used to specify the measurement units, reference temperature, and time base to be used during recalculation.

Figure 4-22 NOC Recalc display – General panel, Well Test mode

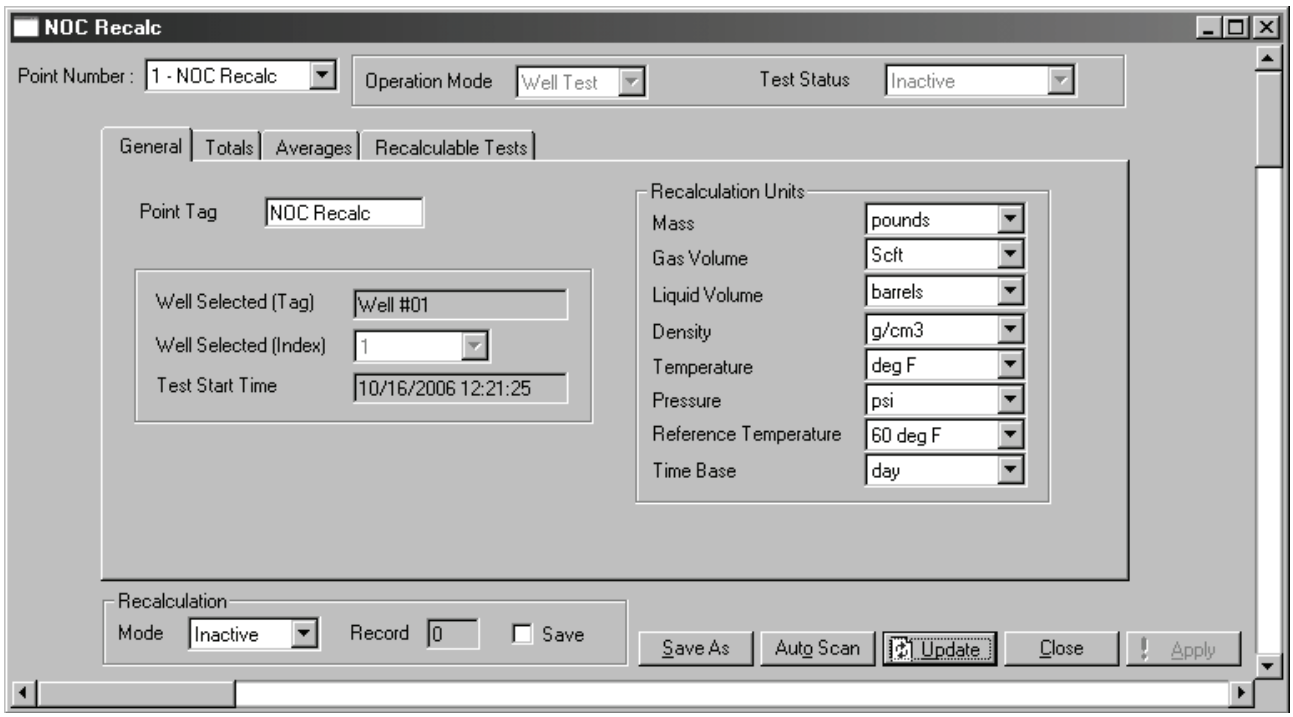


Table 4-18 NOC Recalc parameters – General panel

Parameter	Description	Comments
Point Number Point Tag	The current function	Read-only
Well Selected (Tag)	The name of the well whose test is selected for recalculation	Well tests are selected on the Recalculable Tests panel
Well Selected (Index)	The number of the well whose test is selected for recalculation	
Test Start Time	The start time of the test selected for recalculation	

Table 4-18 **NOC Recalc parameters – General panel** *continued*

Parameter	Description	Comments
Units		
Mass	The mass unit to be used in the recalculation	Default: Unit used in original measurement and calculation
Gas Volume	The gas volume unit to be used in the recalculation	
Liquid Volume	The liquid volume unit to be used in the recalculation	
Density	The density unit to be used in the recalculation	
Temperature	The temperature unit to be used in the recalculation	
Pressure	The pressure unit to be used in the recalculation	
Reference Temperature	The reference temperature to which oil density and water density will be corrected in the recalculation	
Time Base	The time unit to be used in the recalculation	

4.6.2 NOC Recalc display – Totals panel

The NOC Recalc Totals panel (see Figure 4-23 and Table 4-19) displays NOC totals, either before or after recalculation.

Figure 4-23 **NOC Recalc display – Totals panel**

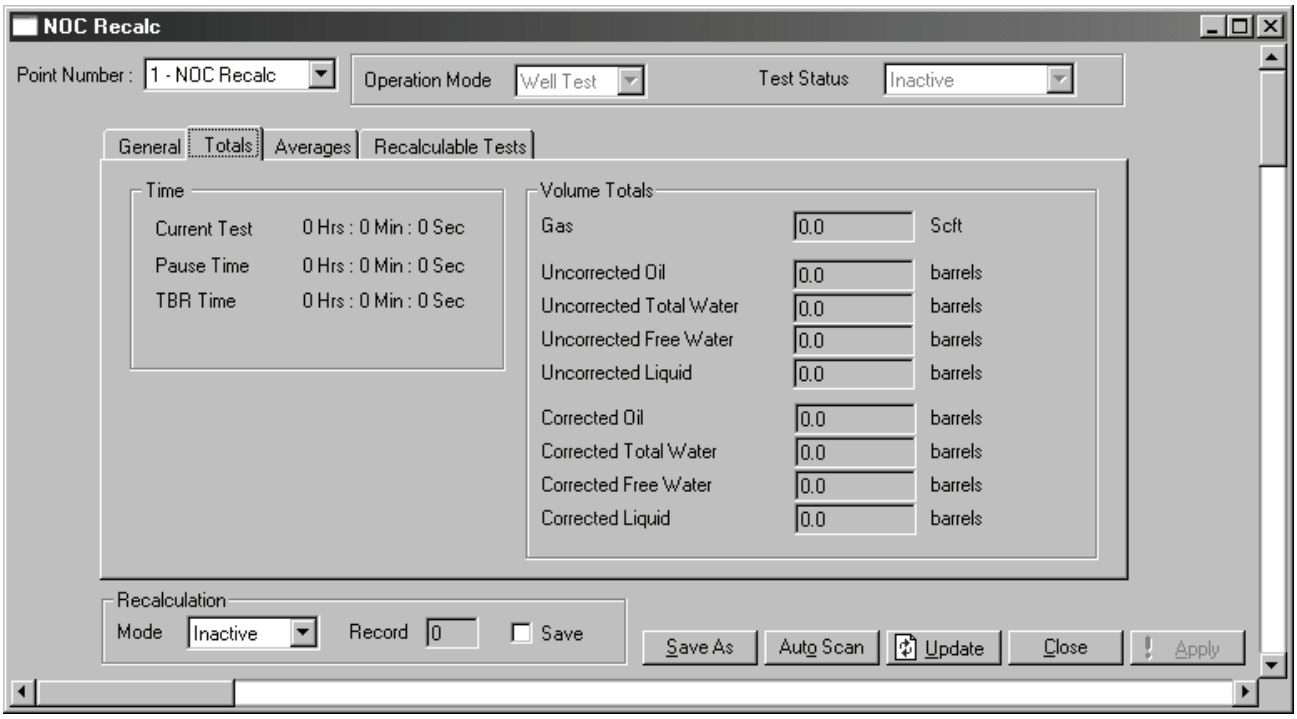


Table 4-19 NOC Recalc parameters – Totals panel

Parameter	Description	Comments
Time		
Current Test	Duration of the selected well test or contract period, in minutes	
Pause Time	Total pause time recorded for the selected well test or contract period, in minutes	
TBR Time	Total of all transient bubble intervals recorded for the selected well test or contract period, in minutes	
TMR Time	Not supported in the current release	
Volume Totals		
Gas	The amount of gas measured during the selected test or period	
Uncorrected Oil	The amount of oil measured during the selected test or period, uncorrected for temperature or pressure	
Uncorrected Total Water	The amount of all water measured during the selected test or period, uncorrected for temperature or pressure	
Uncorrected Free Water	The amount of free water measured during the selected test or period, uncorrected for temperature or pressure	
Uncorrected Liquid	The amount of process fluid measured during the selected test or period, uncorrected for temperature or pressure	
Corrected Oil	The amount of oil measured during the selected test or period, corrected for temperature and pressure	
Corrected Total Water	The amount of all water measured during the selected test or period, corrected for temperature and pressure	
Corrected Free Water	The amount of free water measured during the selected test or period, corrected for temperature and pressure	
Corrected Liquid	The amount of process fluid measured during the selected test or period, corrected for temperature and pressure	

4.6.3 NOC Recalc display – Averages panel

The NOC Recalc Averages panel (see Figure 4-24 and Table 4-20) displays NOC totals, either before or after recalculation.

Figure 4-24 NOC Recalc display – Averages panel

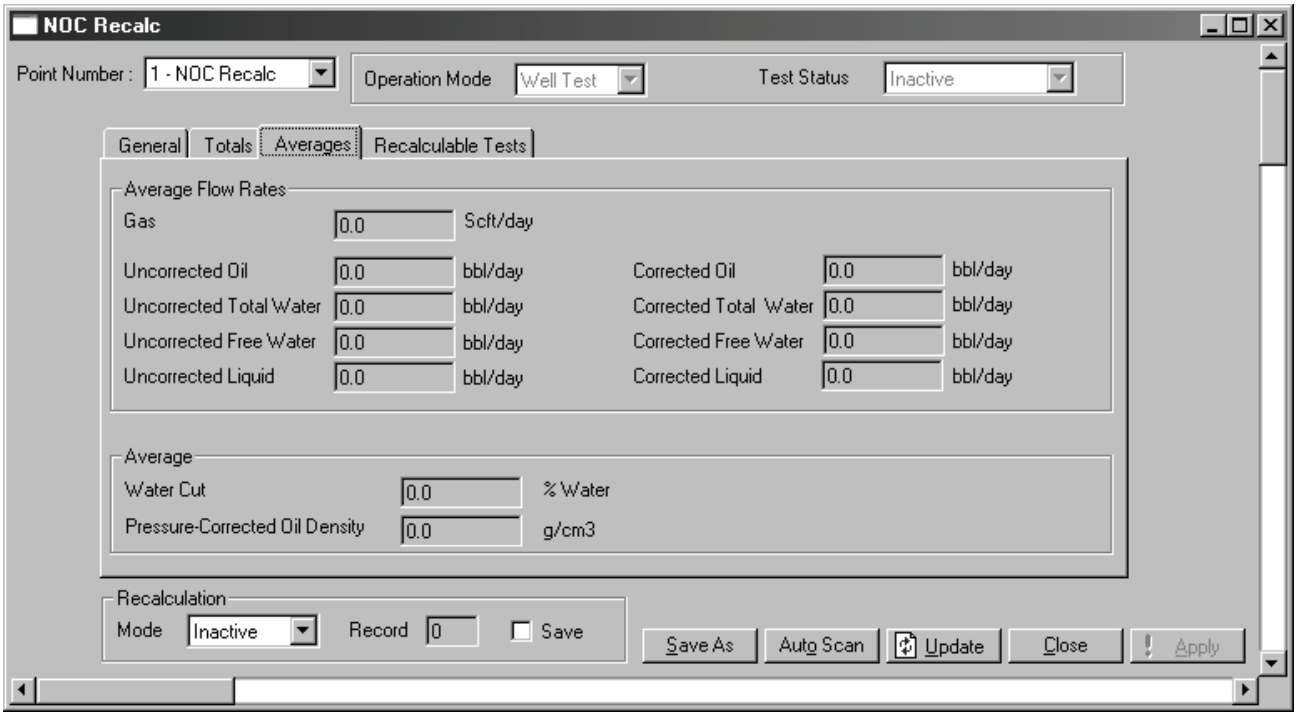


Table 4-20 NOC Recalc parameters – Averages panel

Parameter	Description	Comments
Average Flow Rates	*All average values in this section are flow-weighted.*	
Gas	Average flow rate of gas for the selected test or period	
Uncorrected Oil	Average volume flow rate of oil for the selected test or period, not corrected for temperature or pressure	
Uncorrected Total Water	Average volume flow rate of all water for the selected test or period, not corrected for temperature or pressure	
Uncorrected Free Water	Average volume flow rate of free water for the selected test or period, not corrected for temperature or pressure	
Uncorrected Liquid	Total volume flow rate of all process fluid for the selected test or period, not corrected for temperature or pressure	
Corrected Oil	Average volume flow rate of oil for the selected test or period, corrected for temperature and pressure	
Corrected Total Water	Average volume flow rate of all water for the selected test or period, corrected for temperature and pressure	
Corrected Free Water	Average volume flow rate of free water for the current period, corrected for temperature and pressure	

Table 4-20 NOC Recalc parameters – Averages panel *continued*

Parameter	Description	Comments
Average	*All average values in this section are flow-weighted.*	
Water Cut	Average water cut used during the selected test or period	
Pressure-Corrected Oil Density	The average oil density for the selected test or period, corrected for temperature and pressure	

4.6.4 NOC Recalc display – Recalculable Tests panel

The NOC Recalc Recalculable Tests panel is used to select the well test or contract period to be recalculated. There are two versions of this panel: the version displayed depends on the configured Operation Mode. See Figures 4-25 and 4-26 and Table 4-21.

Figure 4-25 NOC Recalc display – Recalculable Tests panel, Well Test mode

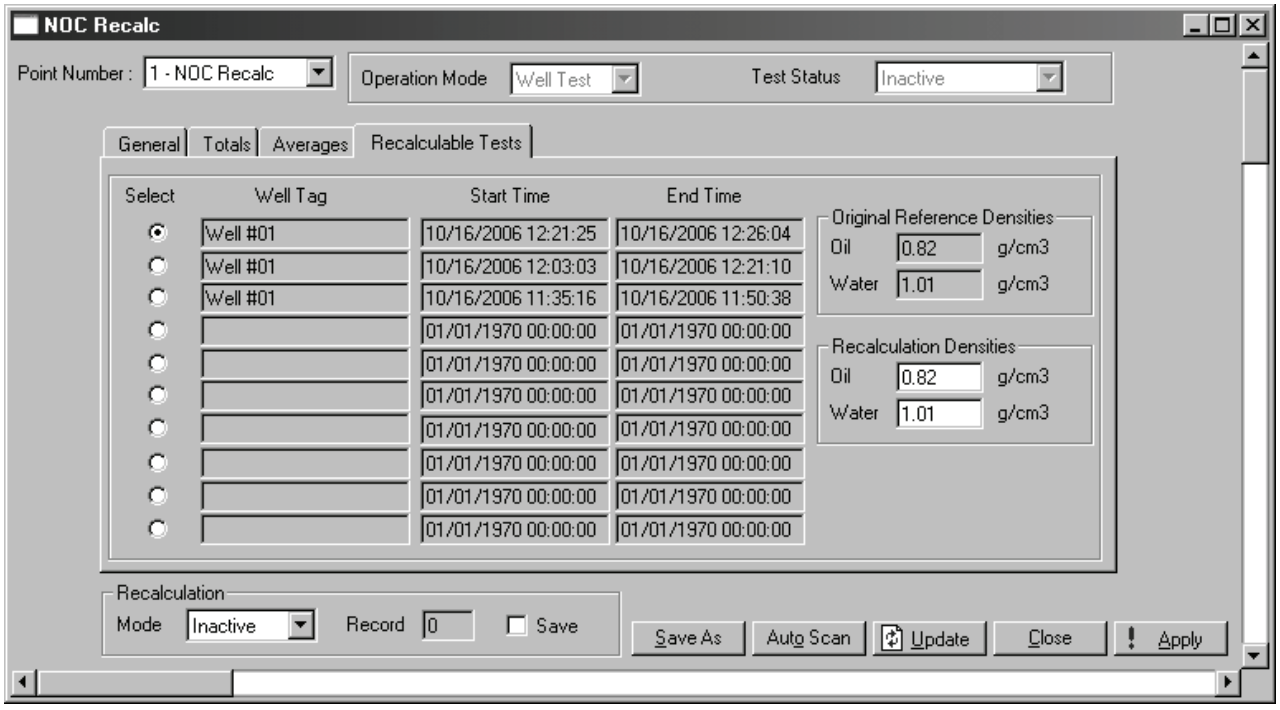


Figure 4-26 **NOC Recalc display – Recalculable Tests panel, Continuous mode**

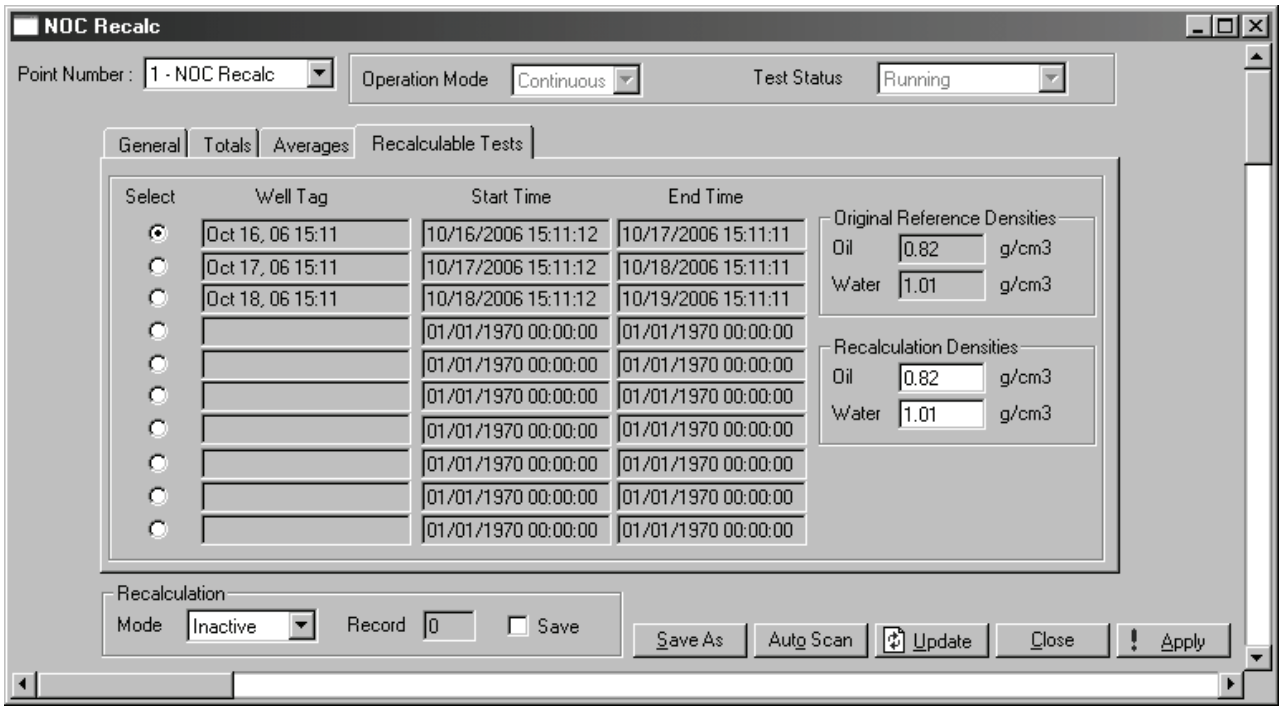


Table 4-21 **NOC Recalc parameters – Recalculable Tests panel**

Parameter	Description	Comments
Selection List	The NOC measurements available for recalculation. • In Well Test mode, data for individual well tests can be recalculated. Available well tests are displayed by well name, test start time, and test end time • In Continuous mode, data for individual contract periods can be recalculated. The available contract days are displayed by date, and the start and end time of the contract period.	
Original Reference Densities		
Oil	The configured oil density at reference temperature for the selected well.	Configured on the Well Data Configuration panel (see Section 4.5.1)
Water	The configured water density at reference temperature for the selected well.	Configured on the Well Data Configuration panel (see Section 4.5.1)
Recalculation Densities		
Oil	The value for oil density at reference temperature to be used in the recalculation procedure	
Water	The value for water density at reference temperature to be used in the recalculation procedure	

Chapter 5
Configuring the NOC System

5.1 About this chapter

This chapter explains how to configure the NOC system and the Net Oil Computer Software. This includes:

- General procedure – see Section 5.2
- Configuring the NOC Station – see Section 5.3
- Configuring the well – see Section 5.4
- Configuring the MMI Interface – see Section 5.5
- Configuring pressure compensation (optional) – see Section 5.5
- Configuring NOC Meters – see Section 5.6
- Configuring transient bubble remediation (optional) – see Section 5.6

In general, perform configuration tasks in the order listed here.

For a detailed listing of the user-defined points in the Net Oil Computer Software, see Appendix A.

5.2 General procedure

To begin configuration:

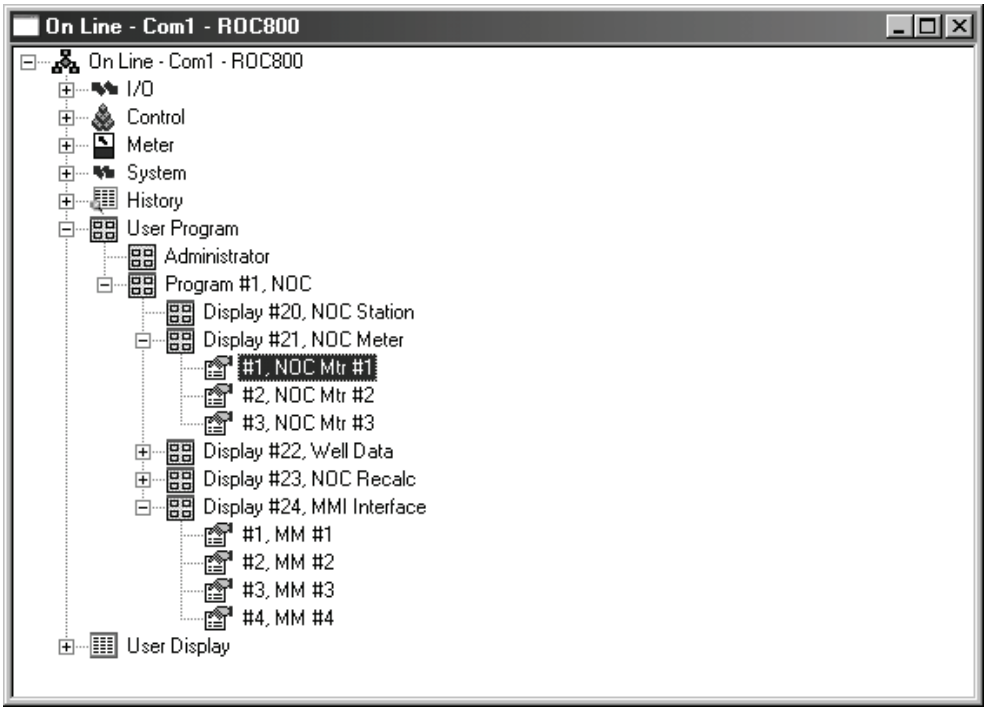
1. Start ROCLINK 800 and connect to the ROC809 platform.
2. In ROCLINK 800, select the Configuration Tree window.
3. Expand the User Program nodes as shown in Figure 5-1.

As you work through the configuration tasks in this chapter, use the Configuration Tree window to select the display you want to configure.

Micro Motion recommends the following good practices:

- During configuration, save your work to flash memory at frequent intervals.
- After configuration is complete, save the configuration to flash memory and to a file.

Figure 5-1 **Net Oil Computer Software in Configuration Tree window**



5.3 Configuring the NOC Station

To configure the NOC Station:

1. In the Configuration Tree window, double-click the NOC Station node.
2. Configure the following parameters:
   a. General panel (see Section 4.2.1):
      - **Point Tag**
      - **Operation Mode**
      - **Contract Hour** (Continuous mode only)
   b. Units panel (see Section 4.2.2):
      - Measurement units
      - **Reference Temperature**
      - **Time Base**
3. Click **Apply**.
4. If your NOC system includes gas measurement, see Section 6.2 for configuration instructions for the Associated Gas Station.

Note the following:

- The station name specified here refers to the Net Oil Computer Software running on this ROC809 platform. It is not the same station name that is configured for the device. However, it may be convenient to assign the same tag to both stations.
- The Net Oil Computer Software does not allow you to change measurement units, time base, or reference temperature during a well test. If you change measurement units, time base, or reference temperature during Continuous mode measurement, you will introduce a discontinuity into the data.

  If you need to change this information, Micro Motion recommends:

  - In Well Test mode, complete the well test, make the required changes, and use the new measurement units for subsequent tests. Use the recalculation feature (see Section 8.7) to convert existing well test data to different measurement units.
  - In Continuous mode, wait until the contract period has expired, or manually force an end of day (see Section 8.3.2). Make the required changes, then force another end of day and resume data collection. Use the recalculation feature (see Section 8.7) to convert existing data to different measurement units.

  Note that if you choose to store the recalculated data on the ROC platform, it will be returned to the original units for ease of comparison. You must manually record the recalculated data if you want to preserve the converted units.

5.4 Configuring the wells

For each well that will be measured:

1. In the Configuration Tree window, expand the Well Data node and click the number of the well you want to configure.
   - For Continuous mode measurement, configure Well #01.
   - For Well Test mode, configure all wells to be tested through this system.
2. On the Configuration panel (see Section 4.5.1), configure the following parameters:
   - **Well Tag** (Well Test mode only)
   - **Oil Density at Reference Temperature**
   - **Water Density at Reference Temperature**
   - **Purge Time** (Well Test mode only)

   If you do not know the density values at reference temperature for this well:
   - You can perform a density determination for oil and/or a density determination for water. See Chapter 7.
   - You can configure the well with approximate values now, and recalculate NOC measurement data when accurate density values are available. See Section 8.7.
3. Click **Apply**.

5.5 Configuring the MMI Interface(s)

The MMI Interface specifies how the Net Oil Computer Software will communicate with the Micro Motion sensor. There is one MMI Interface for every Micro Motion sensor in the NOC system.

Before configuring an MMI Interface, you must understand how Micro Motion sensors are mapped to NOC Meters. See Section 2.4.1.

To configure an MMI Interface:

1. In the Configuration Tree window, expand the MMI Interface node and click the number of the MMI Interface you want to configure.
2. On the Comm Setup panel (see Section 4.3.1), configure the following parameters:
   - **Point Tag**
   - **Comm Port for Device Access** – **COM 4, TAG** (**95, 3, 0**)
   - **Modbus Address** – Modbus address of the core processor associated with this sensor. The default value is **1**.
   - **Communications Scanning** – **Enabled**
3. If you want to implement pressure compensation (see Section 2.10):
   a. Open the Pressure Compensation panel (see Section 4.3.4).
   b. Enter the compensation coefficient for density and/or mass.
   c. Click the appropriate checkbox(es).
   d. Ensure that the required pressure data will be available via the NOC Meter (see Section 5.6, Step 3c).
4. Click **Apply**.
5. To test the connection, open the Registers panel (see Section 4.3.2), and click **Update**. You should see process data from the sensor. If you do not, check all wiring, ensure that the core processor is powered up, and that you are using the correct Modbus address.

5.6 Configuring an NOC Meter

Before configuring an NOC Meter, you must understand how Micro Motion sensors are mapped to NOC Meters. There is one NOC Meter for every Micro Motion sensor used for NOC measurement. The NOC Meter receives sensor data through the MMI Interface. See Section 2.4.1.

To configure an NOC Meter:

1. In the Configuration Tree window, expand the NOC Meter node and click the number of the NOC Meter that you want to configure.
2. On the General panel (see Section 4.4.1), configure the following parameters:
   - **Point Tag**
   - **Alarming** – If you enable alarming, be sure to configure the alarm setpoints on the Alarms panel as desired (see Step 4).
   - **Water Cut Setpoint for Free Water** – If this NOC Meter is on an oil or liquid leg, set the setpoint to the appropriate water cut. If this NOC Meter is on a water leg, set the setpoint to **0**. See Section 2.4.2.
3. On the Inputs panel (see Section 4.4.2):
   a. Click the **Auto Configure Inputs** checkbox and click **Apply**.
   b. Click **Update** and verify that inputs for the following process variables have been defined:
      - Coriolis Drive Gain – **UDP71 *x*, R291 (71, *y*, 32)**
      - Coriolis Mass – **UDP71 *x*, R259CU (71, *y*, 44)**
      - Density – **UDP71 *x*, PCDENS (71, *y*, 39)**
      - Temperature – **UDP71 *x*, R251CU (71, *y*, 42)**

If they are not defined, use the TLP dialog box to define them. Be sure to specify the appropriate MMI Interface (NOC Meter 1 uses MMI Interface 1, NOC Meter 2 uses MMI Interface 2, etc.).

c. Use the TLP dialog box to define the pressure input (if required). A typical pressure input would be **AIN 4-2, 21** (**103, 65, 21**).

d. If you are not using water cut probes, set **Water Cut Probe Mode** to **Ignore**. If you are using water cut probes, see Section 6.3 for configuration instructions.

4. On the Alarms panel (see Section 4.4.7) configure the following parameters:
   - **Low Flow Rate Alarm**
   - **High Flow Rate Alarm**
   - **Alarm Deadband**
   - **Report by Exception** options

Note: Flow alarms will be reported only if alarming is enabled for this NOC Meter (see Step 2).

5. Click **Apply**.
6. If you want to implement transient bubble remediation (see Section 2.11):
   a. Open the TBR panel (see Section 4.4.3).
   b. Specify **Drive Gain Setpoint**, **Lookback Period**, and **Action** as desired.
   c. If the TBR action includes energizing a discrete output, set **DO to Energize** to the discrete output that will be used to indicate that TBR is active.
   d. Enable **TBR Mode**.
   e. Click **Apply**.
7. To test the configuration:
   a. Open the Inputs panel and click **Update**. You should see process data from the sensor. If you do not, verify the MMI Interface that this NOC Meter uses for sensor data.
   b. Open the Instant Values panel (see Section 4.4.4), and click **Update**. You should see NOC measurement data.

Chapter 6
Special Topics in Configuration

6.1 About this chapter

This chapter provides information on the following configuration topics:

- Setting up gas measurement
- Configuring water cut measurement using water cut probes

6.2 Setting up gas measurement

You can measure gas using either an MMI sensor or a conventional (turbine or orifice plate) meter. In both cases, there are three tasks involved in setting up gas measurement:

- Setting up the gas station on the ROC809 platform
- Setting up the gas meter
- Configuring the NOC Gas Station to access the ROC809 gas station

Note: To use the gas measurement functionality of the ROC809, an AGA license must be installed on the ROC809 platform. The AGA license is available from Remote Automation Solutions.

Task 1 Setting up the ROC809 gas station

1. Start ROCLINK 800 and connect to the ROC809 platform.
2. Click **Device > Information**.
3. In the Points panel, ensure that at least one station and one turbine meter or one orifice meter is active.
4. Click **Meter > Setup > Station**.
5. For the station to be configured, select **1 - Coriolis**.

Note: This station is named "Coriolis" by the factory-supplied configuration file. You may name this station as desired.

6. On the General panel:
   - Ensure that **History Segment** is set to **General 00**.
   - Select the calculation standard you want to use. In most cases, this will be **Gas, AGA11** (the first option).

Note: The contract hour is controlled by the Net Oil Computer Software.

7. Configure options on the Gas Quality panel, the Advanced panel, and the Alarms panel according to the information provided in the manual entitled *ROCLINK 800 Configuration Software: User Manual*.
8. Click **Apply** and close the Station Setup window.

Task 2 Setting up the gas meter

1. In ROCLINK 800, click **Meter > Setup**, and select the meter type you are using:
   - If you are using an MMI sensor or a turbine meter, click **Turbine Meter**.
   - If you are using an orifice plate meter, click **Orifice Meter**.
2. In the General panel:
   a. Specify a name or description for the meter.
   b. Select the external gas station that you defined in the previous task (e.g., Coriolis).
   c. For MMI sensors or turbine meters, set **Meter Type** as required:
      - MMI sensor: Meter Type = **Mass**
      - Turbine meter: Meter Type = **Volume**
   d. Click **Apply**.
3. On the Inputs panel:
   a. If you are using an MMI sensor, set **Mass I/O Definition** to the pressure-corrected mass flow rate from MMI #4 (**UDP71 4, PCMASS**) (**71, 3, 38**).

Note: To access the MMI points, you may need to enable Show All Point Types and Parameters.

   b. If you are using a turbine meter, set **Uncorrected Volume I/O Definition** to the analog input from the turbine meter (e.g., **AIN 4-1, EU** or **103, 64, 21**).
   c. If you are using an orifice plate meter: set **Differential Pressure I/O Definition** to the analog input from the orifice plate meter (e.g., **AIN 4-1, EU** or **103, 64, 21**).
   d. For all meter types, set **Static Pressure** to the analog input from the pressure sensor (e.g., **AIN 4-2, EU** or **103, 65, 21**).
   e. For all meter types, set **Temperature** to the analog input from the RTD (e.g., **RTD 9-1, EU** or **106, 144, 0**).
   f. Click **Apply**.
4. Complete meter setup according to the configuration instructions in the manual entitled *ROCLINK 800 Configuration Software: User Manual*. Be sure to review all parameters on all panels.
5. Click **Apply** and close the Meter Setup window.

Task 3 Configuring the NOC Gas Station

1. Open the NOC Station display.
2. For **Associated Gas Station**, specify **STN 1, TAG** (**112, 0, 0**).
3. Click **Apply**.

Data should appear in the Current Gas Flow field when NOC measurement begins:

- For Continuous mode, data should appear immediately.
- For Well Test mode, data should appear when a well test is started.

6.3 Configuring water cut measurement using water cut probes (WCPs)

Be sure to configure water cut measurement on all NOC Meters where water cut probes are installed. To configure water cut measurement using one or two water cut probes:

1. Open the Inputs panel of the NOC Meter display (see Section 4.4.2).
2. For **Low WC Probe** and/or **High WC Probe**, specify the analog input used to retrieve data from the low-end and/or high-end WCP.
3. Using the Water Monitors Limits parameters, specify the range for the WCP(s). For example:
   - If **Low** is set to **20**, the range defined for the low-end WCP is 0 to 20%.
   - If **High** is set to **80**, the range defined for the high-end WCP is 80 to 100%.

   If you want to use data from the WCPs for all water cut values, see Examples 1 and 2 in this section and set range values as described in the applicable example.
4. Set **Water Cut Probe Mode** to **Auto**.
5. Set the **Difference Limit** value as desired. When Water Cut Probe Mode is Auto, the Net Oil Computer Software continually compares the density-based water cut value to the WCP value. When the difference is greater than the specified Difference Limit, the software switches from using the density-based value to using the WCP value, or vice versa. See Example 3.

Example 1

Two water cut probes are installed. You want to use the measured water cut values for all water cut ranges.

1. Set Water Cut Probe Mode to Auto.
2. Configure the Water Monitors Limits parameters to cover the entire span, e.g.:
   - Low = 20 and High = 21
   - Low = 50 and High = 51
   - Low = 20 and High = 81

Example 2

One water cut probe is installed. You want to use the measured water cut values for all water cut ranges.

1. Set Water Cut Probe Mode to Auto.
2. Define the analog input for either the Low Water Monitor or the High Water Monitor (as you prefer).
3. Set the applicable limit to cover the entire span, e.g.:
   - If you are using a Low Water Monitor input, set Low to 100 (the high limit is not applicable). Any value below 100% is now in range.
   - If you are using a High Water Monitor input, set High to 0 (the low limit is not applicable). Any value above 0% is now in range.

Example 3

Two water cut probes are installed. You want to use the low-end probe for all water cut values below 20%, and the high-end probe for all water cut values above 80%.

Configure the water cut parameters as follows:

- Water Monitors Limits: Low: 20
- Water Monitors Limits: High: 80
- Difference Limit: 5
- Water Cut Probe Mode: Auto

At the high end:

- When the density-based water cut value is less than or equal to 80%, NOC measurements are based on the density-based water cut.
- When the density-based value is greater than 80%, the density-based value is compared to the high-end probe value. If the difference is greater than 5, the system will switch to using the water cut value from the probe. The system will continue to use the water cut value from the probe until the density-based value is lower than 80% and the difference is less than 5.

At the low end:

- When the density-based water cut value is greater than or equal to 20%, NOC measurements are based on the density-based water cut.
- When the density-based value is less than 20%, the density-based value is compared to the low-end probe value. If the difference is greater than 5, the system will switch to using the water cut value from the probe. The system will continue to use the water cut value from the probe until the density-based value is greater than 20% and the difference is less than 5.

Chapter 7
Density Determination Routines

7.1 About this chapter

This chapter describes the procedures for performing density determination for oil and water.

7.2 About the density determination routines

To derive water cut from measured density values, the Net Oil Computer Software needs two reference values for the well being tested:

- Live oil density at reference temperature
- Water density at reference temperature

Note: These values are not needed if water cut probes will be used for all water cut data.

The density determination routines provided with the Net Oil Computer Software allow you to obtain these values directly from the NOC system in operation.

The Density Determination panel in the NOC Meter window (see Figure 4-19) is used for density determination. Fields in this panel are listed and defined in Table 4-15.

You cannot perform a density determination while a well test is running, or while the Net Oil Computer Software is in Continuous mode.

7.3 Preparing for density determination

During the density determination for oil, you will need to:

- Pump live oil through a Micro Motion sensor paired with an NOC Meter (see Section 2.4.1), ensuring that the oil contains as little water as possible
- Obtain a sample of the live oil
- Obtain laboratory values for the water cut and the water temperature of the sample

During the density determination for water, you will need to pump free water through a Micro Motion sensor paired with an NOC Meter. If you do not have a sensor installed on a water leg, you can use the instant density value of the process fluid to help determine what fluid is flowing through the sensor. The first fluid flowing through the sensor is typically water from the water layer in the separator, and you should see a stable density value. This process fluid can be used for the density determination of water. As the fluid transitions from water to oil, the density value will fluctuate. When the density value stabilizes again, the fluid flowing through the sensor is oil from the oil layer.

7.4 Density determination for oil

To perform density determination for oil:

1. Open the NOC Station display and select the well whose oil density you are measuring. Click **Apply**.
2. If Operation Mode is set to Continuous, change to Well Test (see Section and Section 4.2.1). If a well test is in progress, stop the test (see Section 8.4.1).
3. Open the NOC Meter display and select the NOC Meter installed on the oil or liquid leg that you want to use.
4. Select the Density Determination panel (see Section 4.4.8).
5. Set **Total Sample Time** to the desired value and click **Apply**.
6. Set **DDR Command** to **Start Oil** and click **Apply**.
7. While the test is running (**Sample Time Remaining** > **0**), collect a sample of the process fluid. Use standard methods (centrifuge, distillation, Karl-Fischer, etc.) to determine:
   - Water cut (percentage of water in the sample)
   - Water cut temperature (temperature of the water in the sample)
8. When the test has finished (**Sample Time Remaining** = **0**), enter the **Water Cut In Sample** and **Sample Temperature** values from the sample and click **Apply**.
9. Set **DDR Command** to **Apply Water Cut** and click **Apply**.
10. The calculated oil density at reference temperature is displayed in the DDR Oil Density at Ref field. You may need to click **Update** to see it.
11. If you want to save the calculated oil density, set **DDR Command** to **Save Oil Density** and click **Apply**. The Oil Density at Ref field will be updated with the calculated value. You can verify this by checking the Configuration panel in the Well Data window.

At any time during the density determination procedure:

- You can set **DDR Command** to **Reset** and click **Apply**. This will reset only the Total Uncorrected Volume value shown on the Density Determination panel. This function is used to allow you to refill the separator, if required, before performing the density determination.
- You can set **DDR Command** to **End** and click **Apply**. This will stop the density determination measurements, but does not reset any values. If desired, you can still enter the **Water Cut In Sample** and **Sample Temperature** values from the sample, apply the water cut, and save the calculated value to the NOC system.

7.5 Density determination for water

To perform density determination for water:

1. Open the NOC Station display and select the well whose water density you are measuring. Click **Apply**.
2. If Operation Mode is set to Continuous, change to Well Test (see Section and Section 4.2.1). If a well test is in progress, stop the test (see Section 8.4.1).
3. Open the NOC Meter display and select the NOC Meter installed on the water leg, or on the leg that you will pump water through.
4. Select the Density Determination panel (see Section 4.4.8).
5. Set **Test Time** to the desired value and click **Apply**.
6. Set **Measurement Mode** to **Start Water** and click **Apply**.

7. When the test has finished (**Sample Time Remaining** = 0), the calculated water density at reference temperature is displayed in the DDR Water Density at Ref field. You may need to click **Update** to see it.
8. If you want to save the calculated water density, set **DDR Command** to **Save Water Density** and click **Apply**. The Water Density at Ref field will be updated with the calculated value. You can verify this by checking the Configuration panel in the Well Data window.

At any time during the density determination procedure:

- You can set **DDR Command** to **Reset** and click **Apply**. This will reset only the Total Uncorrected Volume value shown on the Density Determination panel. This function is used to allow you to refill the separator, if required, before performing the density determination.
- You can set **DDR Command** to **End** and click **Apply**. This will stop the density determination measurements, but does not reset any values. If desired, you can still save the calculated value to the NOC system.

Chapter 8
Using the NOC System

8.1 About this chapter

This chapter explains how to use the NOC system via the ROCLINK 800 user interface. The following topics are discussed:

- Operation mode – see Section 8.2
- Using Continuous mode and viewing data – see Section 8.3
- Performing a well test and viewing well test data – see Section 8.4
- Viewing flow and status alarms – see Section 8.5
- Viewing gas data – see Section 8.6
- Using the Recalculation feature – see Section 8.7

8.2 Operation mode

The NOC system can run in either Continuous mode or Well Test mode:

- In Continuous mode, the NOC system continuously monitors a well, separator, or pipeline. By default, NOC measurement data is written to the history database:
  - Every minute
  - Every 15 minutes (for some values), or every 60 minutes (for other values)
  - At the end of each contract period, as defined by the contract hour or a manual end of day
- In Well Test mode, the NOC system performs NOC measurement on a single well. It is the user's responsibility to ensure that output from the correct well is routed through the system and that the appropriate purge time is configured. The well test is started and ended manually. During the well test, measurement may be paused and restarted. When the test is ended, well test data is automatically written to the history database.

8.2.1 Changing operation mode

Micro Motion recommends that you perform the initial configuration of the Net Oil Computer Software for the operation mode that will be used, and thereafter change modes as little as possible. However, you can safely change modes at certain points during operation, as described below.

From Continuous to Well Test

To change from Continuous mode to Well Test mode, Micro Motion recommends that you either wait until the end of the current contract period or force an end of day (see Section 8.3.2).

History data for Continuous mode will be overwritten as well tests are performed. Before changing modes, ensure that you have performed all desired recalculations and viewed or retrieved all desired data.

From Well Test to Continuous

If you change from Well Test mode to Continuous mode:

- While a well test is in progress (either running or paused), the current well test is stopped and current well test data is lost.
- When no well test is active, no well test data is lost.

Well test data will be overwritten as Continuous mode records are written. Before changing modes, stop the well test if you need its data, then ensure that you have performed all desired recalculations and viewed or retrieved all desired data.

8.2.2 Managing tags when changing modes

The Net Oil Computer Software uses one set of tags for both well names and contract periods. As a result, you may see contract period dates when you expect to see well names, or vice versa. This effect will appear:

- In the NOC Station General panel
- In the Recalculable Tests Recalc panel
- In all Well Data panels

If you want to reset the tags:

- From well names to contract periods, download the Well Data points from the startup configuration file named NOCStartup_CONTINUOUS.800.
- From contract periods to well names, download the Well Data points from the startup configuration file named NOCStartup_WELLTEST.800.

Note: Downloading other point types will overwrite existing configuration data.

8.3 Using Continuous mode

Continuous mode can measure only Well #01. Before using Continuous mode, ensure that Well #01 is correctly configured for the well that will be measured (see Section 5.4).

8.3.1 Starting Continuous mode measurement

To start Continuous mode measurement:

1. Ensure that the desired stream is flowing through the system.
2. Start ROCLINK 800 and connect to the ROC809.
3. Open the NOC Station display.
4. In the General panel (see Figure 4-2):
   a. Set **Operation Mode** to **Continuous** and click **Apply**.
   b. Reconfigure **Contract Hour** if desired.

Continuous mode measurement will continue until Operation Mode is switched to Well Test. During Continuous mode measurement:

- The Status field displays the current state of the process.
- Current data is shown in the NOC Station display, the NOC Meter display, and the MMI Interface display (see Section 8.3.4).
- History data is recorded at the configured intervals.
- At the configured contract hour, values are totaled for a single day's production, totals are reset, and data is logged to the Daily History database.

If Continuous mode measurement is interrupted due to a power failure or power shutoff, the NOC system resumes measurement as soon as power is restored. Visually inspect data for the affected contract period. If appropriate, use Force End of Day (see Section 8.3.2) to start a new contract period, and discard the data from the affected contract period.

8.3.2 Using Force End of Day

The Force End of Day checkbox located on the NOC Station General panel (see Figure 4-2) can be used to perform contract hour actions manually. To do this:

1. Check the **Force End of Day** checkbox.
2. Click **Apply**.

As a result:

- Current daily, hourly, and min/max values will be logged to the history database.
- All totals will be reset.

Note: Do not use the Force End of Day button on the History Segment Configuration window. This button does not write NOC measurement data to history.

8.3.3 Changing parameters during Continuous mode measurement

If you change the well configuration values, measurement units, reference temperature, or time base during a contract period, the changes are not applied to existing data. As a result, you will introduce discontinuities into the data for that contract period. If you need to change any of these values:

1. Force an end of day (see Section 8.3.2).
2. Reconfigure as required.
3. Force a second end of day.
4. Discard measurement data for the contract period used for reconfiguration.

If you need to apply different reference values or measurement units to existing data, use the Recalculation feature (see Section 8.7).

8.3.4 Viewing Continuous mode current data

While Operation Mode is set to Continuous, current data is available in several locations:

- The NOC Station display shows NOC measurement data summed or averaged across NOC Meters:
  - The Instant Values fields on the General panel (Figure 4-2)
  - The Totalizers panel (Figure 4-4)
  - The Averages panel (Figure 4-5)
- The NOC Meter display shows NOC measurement data for a single NOC Meter. See:
  - The Instant Values panel (Figure 4-15)
  - The Totalizers panel (Figure 4-16)
  - The Averages panel (Figure 4-17)
- The Registers panel in the MMI Interface display shows data from a single Micro Motion sensor, before NOC calculations have been performed. See Figure 4-9.

8.3.5 Viewing Continuous mode contract period data

While Operation Mode is set to Continuous, data is available for the following data collection periods:

- The 10 most recent contract periods, including the current period
- The current month (assuming that each contract period is a day)
- The previous month
- All history data since Continuous mode measurement was started, including any pauses, stops, and starts.

Note: If you set Operation Mode to Well Test, all history data accumulated for Continuous mode is overwritten.

For each data collection period, you can view:

- History for the NOC Station or history for a single NOC Meter
- The original data and recalculated data

To view history data:

1. Open the Well Data display and select the History panel.
2. Use the **Point Number** dropdown list to specify the data collection period you want to view:
   - To view current data, select **1** (today's date).
   - To view data for a previous day, select the point for that day. For example, for yesterday, select **2** (yesterday's date); for the day before yesterday, select **3**, and so on.
   - To view summary data for the current month, select **37** (This Month).
   - To view summary data for the previous month, select **38** (Previous Month).
   - To view summary data since Continuous mode measurement was started, select **39** (Forever).
3. Use the **Station Record to Retrieve** dropdown list to specify the stream you want to view.
4. Click **Apply**.

8.4 Performing a well test

To perform a well test:

1. Ensure that the desired stream is flowing through the NOC Station.
2. Start ROCLINK 800.
3. Connect to the ROC809.
4. Open the NOC Station display.
5. Ensure that **Operation Mode** is set to **Well Test**.
6. In the Well Selection panel (see Figure 4-6), select the well to be tested and click **Apply**.
7. In the General panel (see Figure 4-1), set **Running Mode** to **Start** and click **Apply**.

The well test will continue until it is manually paused or ended, or Operation Mode is switched to Continuous. During a well test:

- The Status field displays the current state of the well test.
- Current data is shown in the NOC Station display, the NOC Meter display, and the MMI Interface display (see Section 8.4.3).

If a well test is interrupted due to a power failure or accidental power shutoff, the well test will continue from the point of interruption when power is restored.

8.4.1 Pausing or stopping a well test

To pause a well test:

1. Open the NOC Station display.
2. On the General panel, set **Running Mode** to **Pause** and click **Apply**.

   The status is changed to Stopped, and totalizing stops for all streams (oil and water). Time spent in this state is reported as Pause Time in the Totalizers panel.
3. To restart a well test, set **Running Mode** to **Start** and click **Apply**.

   Totalizing is resumed. If a well test is paused, the average daily flow rate over the test period is calculated as follows:

$$\frac{\text{CumulativeTotalForTest}}{\text{TestTime}} \times 24$$

To stop a well test, with no restart possible:

1. Open the NOC Station display.
2. On the General panel, set **Running Mode** to **End Test**, and click **Apply**.

   Status is changed to Inactive. The completed well test is saved in history. To view well test data, see Section 8.4.4.

8.4.2 Changing parameters during a well test

The Net Oil Computer Software does not allow you to change the measurement units, reference temperature, or time base during a well test.

The Net Oil Computer Software does allow you to change the values configured for oil density at reference temperature and water density at reference temperature. However, if you do so, you will introduce discontinuities into the data. If you need to change any of these values:

1. Stop the well test.
2. Reconfigure as required.
3. Start a new well test.
4. Use the Recalculation feature (see Section 8.7) to convert the existing well test data to the new reference values.

8.4.3 Viewing current well test data

During the well test, current data is available in several locations:

- The NOC Station display shows NOC measurement data summed or averaged across NOC Meters:
  - The Instant Values fields on the General panel (Figure 4-1)
  - The Totalizers panel (Figure 4-4)
  - The Averages panel (Figure 4-5)
- The NOC Meter display shows NOC measurement data for a single NOC Meter. See:
  - The Instant Values panel (Figure 4-15)
  - The Totalizers panel (Figure 4-16)
  - The Averages panel (Figure 4-17)
- The Registers panel in the MMI Interface display shows data from a single Micro Motion sensor, before NOC calculations have been performed. See Figure 4-9.

8.4.4 Viewing stored well tests

For each well, NOC system history stores data for the current well test and for the five previous well tests. To view well test data from history:

1. Open the Well Data display and select the History panel.
2. Use the **Point Number** dropdown list to select the well you want to view.
3. Use the **History Record to Retrieve** dropdown list to specify the well test you want to view and click **Apply**.

For information on the displayed data, see Figure 4-21 and Table 4-17.

8.5 Viewing flow and status alarms

Flow alarms are detected by the NOC Meters. Flow alarms can be viewed on the Alarms panel of the specific NOC Meter (see Figure 4-18), or on the NOC Station Alarms panel (see Figure 4-7), which shows information for all NOC Meters.

Status alarms from the Micro Motion sensor are displayed on the MMI Interface Alarms panel (see Figure 4-10).

8.6 Viewing gas data

If the NOC system includes a gas meter, gas data is available:

- On the NOC Station display:
  - The current gas flow rate is displayed on the General panel (see Figure 4-1 or Figure 4-2).
  - The total gas volume for the current period or well test is displayed on the Totalizers panel (see Figure 4-4).
  - The average gas flow rate is displayed on the Averages panel (see Figure 4-5).
- On the Well History panel (see Figure 4-21)

8.7 Using the Recalculation feature

The Recalculation feature allows you to recalculate NOC data for a well test or for a contract period. For a discussion of the Recalculation feature, see Section 2.13.

8.7.1 For well tests

Recalculation of well test data is limited to the ten most recent well tests for which periodic records are available.

Note the following:

- The recalculation is based on all periodic records written during the well test. If the well test was paused for a significant amount of time, the results of the recalculation may not be valid.
- If the well test was run for more than 10 days, the recalculation may not be valid because periodic records more than 10 days old will have been deleted.

To recalculate a well test:

1. Ensure that the NOC system is running in Well Test mode.
2. Open the NOC Recalc display.
3. Open the Recalculable Tests panel (see Figure 4-25). The tests available for recalculation are displayed.
   a. Click the radio button for the test you want to recalculate.
   b. Click **Apply**.
4. The **Original Reference Densities** fields display the values used for oil density at reference temperature and water density at reference temperature during the selected test. If you want to change either of these values:
   a. Enter the new value(s) in the **Recalculation Densities** field(s).
   b. Click **Apply**.
5. If you want to change any of the measurement units, the reference temperature, or the time base:
   a. Open the General panel (see Figure 4-22) and configure the parameter(s) as desired.
   b. Click **Apply**.

Note: The configured Reference Temperature must be appropriate to the Recalculation Densities values on the Recalculable Tests panel.

6. When all desired changes have been made:
   a. Select **Start** from the **Mode** dropdown list at the bottom of the window.
   b. Click **Apply**.

   You might find it useful to run the recalculation from the Totalizers or Averages panel so that you can click **Update** and watch the values change. You will need to wait a few seconds for the recalculation to complete.
7. If you want to save the results of the recalculation:
   a. Click the **Save** checkbox at the bottom of the window.
   b. Click **Apply**.

   The recalculated data will be written to history. To view the recalculated data side by side with the original data, see Section 8.4.4.

8.7.2 For contract periods

Recalculation of contract period data is limited to the ten most recent contract periods for which periodic records are available.

To recalculate a contract period:

1. Ensure that the NOC system is running in Continuous mode.
2. Open the NOC Recalc display.
3. Open the Recalculable Tests panel (see Figure 4-26). The contract periods available for recalculation are displayed.
   a. Click the radio button for the contract period you want to recalculate.
   b. Click **Apply**.
4. The **Original Reference Densities** fields display the values used for oil density at reference temperature and water density at reference temperature during the selected contract period. If you want to change either of these values:
   a. Enter the new value(s) in the **Recalculation Densities** field(s).
   b. Click **Apply**.
5. If you want to change any of the measurement units, the reference temperature, or the time base:
   a. Open the General panel (see Figure 4-22) and configure the parameter(s) as desired.
   b. Click **Apply**.

Note: The configured Reference Temperature must be appropriate to the Recalculation Densities values on the Recalculable Tests panel.

6. When all desired changes have been made:
   a. Select **Start** from the **Mode** dropdown list at the bottom of the window.
   b. Click **Apply**.

   You might find it useful to run the recalculation from the Totalizers or Averages panel so that you can click **Update** and watch the values change. You will need to wait a few seconds for the recalculation to complete.

7. If you want to save the results of the recalculation:
   a. Click the **Save** checkbox at the bottom of the window.
   b. Click **Apply**.

   The recalculated data will be written to history. To view the recalculated data side by side with the original data, see Section 8.3.5.

Chapter 9
History and Modbus Interface

9.1 About this chapter

This chapter discusses:

- History on the ROC809 platform – see Section 9.2
- The Modbus interface on the ROC809 platform – see Section 9.3

9.2 History on the ROC809 platform

Although you can view NOC data through the history function, Micro Motion recommends using the Net Oil Computer Software to view NOC data. The Net Oil Computer Software compiles and presents NOC data in a more usable form (see Sections 8.3.4, 8.3.5, 8.4.3, and 8.4.4).

However, you may want to add history points to the default history configuration. Note the following:

- Three history segments have been predefined by the Net Oil Computer Software: General 00, Segment 01, and Segment 02. Most of the General 00 segment and all of Segment 01 are used for internal processing. Part of the General 00 segment and all of Segment 02 are available for site use. See Table 9-1. Do not change any history that is reserved by the Net Oil Computer Software. If you do, the NOC system will not function correctly.

Table 9-1 Predefined segments

Segment	Point #	Description
General 00	1–10	Available for site use
	11–61	Reserved for use by Net Oil Computer Software
Segment 01	1–42	Reserved for use by Net Oil Computer Software
Segment 02	1–70	Available for site use

- If you add history points, you must use the history function to view these records. For information on configuring and accessing history, see the manual entitled *ROCLINK 800 Configuration Software: User Manual*.
- Before configuring history, review the data provided by the Net Oil Computer Software to determine whether or not you need additional history (see Sections 8.3.4, 8.3.5, 8.4.3, and 8.4.4).

9.3 Modbus interface on the ROC809 platform

For general information on the Modbus interface provided by the ROC809 platform, see the manual entitled *ROCLINK 800 Configuration Software: User Manual*.

If you want to use the Modbus interface, note the following:

- Because NOC data is not stored in standard history, the Modbus History window is not used for access to NOC data. The Modbus History window is used only to define the date, time, and event/alarm log indexes. In most cases, the default values should be used.
- The NOCStartup.800 configuration file includes predefined Modbus register ranges that provide access to most of the Net Oil Computer Software data, including process data, unit data, and some configuration data. All of the predefined register ranges have been defined for use by any comm port. You can modify the predefined register ranges if you wish: NOC system operation will not be affected.

9.3.1 Predefined Modbus register ranges

The predefined Modbus register ranges are organized into Modbus register tables 1–15 as shown in Table 9-2.

Table 9-2 Predefined Modbus register ranges

NOC data	Modbus register table	See
NOC Station	1	Table 9-3
NOC Meter data		
• NOC Meter 1	2	Table 9-4, Column 2
• NOC Meter 2	3	Table 9-4, Column 3
• NOC Meter 3	4	Table 9-4, Column 4
Recalculation data	5	Table 9-5
	6	Table 9-6
MMI Interface data		
• MMI Interface #1	7	Table 9-7, Column 2
• MMI Interface #2	8	Table 9-7, Column 3
• MMI Interface #3	9	Table 9-7, Column 4
• MMI Interface #4	10	Table 9-7, Column 5
Well configuration data	11	Table 9-8
Well test data		
• Wells 1–15	12	Table 9-9, Column 2
• Wells 16–30	13	Table 9-9, Column 3
• Wells 31–45	14	Table 9-9, Column 4
• Wells 46–50	15	Table 9-9, Column 5

In these tables, the TLP values are provided in both text and numeric format, for convenience. Note the following:

- In text format, numbering for the logicals (e.g., the NOC Meters) begins at 1; in numeric format, numbering for the logicals begins at 0.
- One Modbus register can store:
  - Any 16 bits (= 2 bytes = 1 word)
  - One ASCII character

  Therefore:
  - One Modbus register is required for short integers and binary values.
  - Two Modbus registers are required for floating-point values, long integers, and doublewords.

Table 9-3 Predefined Modbus register ranges – Modbus Register Table 1

Index	Modbus addresses	NOC TLPs and data	Conversion
1	100–110 • 100 • 101 • 102 • 103 • 104 • 105 • 106 • 107 • 108 • 109 • 110	UDP67 1, MUNITS–RUNMD (67, 0, 1–11) • Mass Units • Gas Volume Units • Liquid Volume Units • Density Units • Temperature Units • Pressure Units • Base Temperature • Time Base • Operation Mode • Test Status • Running Mode	28 (to integer)
2	111–111	UDP67 1, WELLIDX (67, 0, 14) • Well Selected (Index)	28 (to integer)
3	1000–1009	UDP67 1, TAG–OPMODE (67, 0, 0) • Point Tag ID (10-character string)	0 (none)
4	1010–1023 • 1010–1011 • 1012–1013 • 1014–1015 • 1016–1017 • 1018–1019 • 1020–1021 • 1022–1023	UDP67 1, TSTTIME– IWCUTA (67, 0, 15–21) • Current Test Start Date/Time • Station Instant Liquid Mass Flow Rate • Station Instant Liquid Volume Flow Rate, Gross • Station Instant Liquid Volume Flow Rate, Net • Station Instant Water Cut Calculated • Station Instant Water Cut Measured • Station Instant Water Cut Applied	70 (to float)
5	1024–1045 • 1024–1025 • 1026–1027 • 1028–1029 • 1030–1031 • 1032–1033 • 1034–1035 • 1036–1037 • 1038–1039 • 1040–1041 • 1042–1043 • 1044–1045	UDP67 1, PCOD–IRLGFLW (67, 0, 45–55) • API Average Pressure Compensated Oil Density • Total Purge Time • Well Oil Density • Well Water Density • Instant Gas Flow Rate • Instant Oil Density • Instant Water Density • Instant Emulsion Density • Instant Temperature • Instant Reverse Mass Flow • Instant Reverse Liquid Gross Volume Flow	70 (to float)

Table 9-3 Predefined Modbus register ranges – Modbus Register Table 1 *continued*

Index	Modbus addresses	NOC TLPs and data	Conversion
6	1050–1075 • 1050–1052 • 1052–1053 • 1054–1055 • 1056–1057 • 1058–1059 • 1060–1061 • 1062–1063 • 1064–1065 • 1066–1067 • 1068–1069 • 1070–1071 • 1072–1073 • 1074–1075	UDP67 1, TOTTIME–TOTNL (67, 0, 22–34) • Total Time • Total Pause Time • Total TBR Time • Total TMR Time • Total Gas • Total Gross Oil Volume • Total Gross Water Volume • Total Gross Free Water Volume • Total Gross Liquid Volume • Total Net Oil Volume • Total Net Water Volume • Total Net Free Water Volume • Total Net Liquid Volume	70 (to float)
7	1076–1083 • 1076–1077 • 1078–1079 • 1080–1081 • 1082–1083	UDP67 1, TOTM–TOTRTM (67, 0, 56–59) • Total Mass • Total Reverse Mass • Total Reverse Liquid Gross Volume • Total Reverse Flow Time	70 (to float)
8	1100–1119 • 1100–1101 • 1102–1103 • 1104–1105 • 1106–1107 • 1108–1109 • 1110–1111 • 1112–1113 • 1114–1115 • 1116–1117 • 1118–1119	UDP67 1, AVGAS–AVCUT (67, 0, 35–44) • Average Gas • Average Gross Oil Flow Rate • Average Gross Water Flow Rate • Average Gross Free Water Flow Rate • Average Gross Liquid Flow Rate • Average Net Oil Flow Rate • Average Net Water Flow Rate • Average Net Free Water Flow Rate • Average Net Liquid Flow Rate • Average Water Cut Applied	70 (to float)
9	1120–1125 • 1120–1121 • 1122–1123 • 1124–1125	UDP67 1, ADVEN–AVMFLW (67, 0, 60–62) • Average Density • Average Temperature • Average Mass Flow Rate	70 (to float)
10	1130–1149	UDP67 1, WELLTAG (67, 0, 13) • Well Selected (Tag) (20-character string)	0 (none)

Table 9-4 Predefined Modbus register ranges – Modbus Register Tables 2–4

	Modbus addresses				
Index	NOC Meter 1 (Table 2)	NOC Meter 2 (Table 3)	NOC Meter 3 (Table 4)	NOC TLPs and data[1]	Conversion
1	2000–2009	2200–2209	2400–2409	UDP68 *x*, TAG (68, *y*, 0) • Point Tag ID (10-character string)	0 (none)
2	2011–2011	2211–2211	2411–2411	UDP68 *x*, MBDN (68, *y*, 2) • Modbus Device Number	28 (to integer)
3	2012–2021	2212–2221	2412–2421	UDP68 *x*, MBPORT (68, *y*, 3) • COM Port Tag (10-character string)	0 (none)
4	2023–2023	2223–2223	2423–2423	UDP68 *x*, TBRACO (68, *y*, 7) • TBR Action Option	28 (to integer)
5	2024–2025 • 2024 • 2025	2224–2225 • 2224 • 2225	2424–2425 • 2424 • 2425	UDP68 *x*, WMMODE–ACFGC (68, *y*, 31–32) • Water Monitors Mode • Auto Configure Command	28 (to integer)

Table 9-4 Predefined Modbus register ranges – Modbus Register Tables 2–4 *continued*

Index	Modbus addresses: NOC Meter 1 (Table 2)	Modbus addresses: NOC Meter 2 (Table 3)	Modbus addresses: NOC Meter 3 (Table 4)	NOC TLPs and data[1]	Conversion
6	2026–2028	2226–2228	2426–2428	UDP68 *x*, ALMOPT–RBXCO (68, *y*, 63–65)	28 (to integer)
	• 2026	• 2226	• 2426	• Flow Rate Alarm Option	
	• 2027	• 2227	• 2427	• SRBX on Set	
	• 2028	• 2228	• 2428	• SRBX on Clear	
7	2029–2030	2229–2230	2429–2430	UDP68 *x*, CALNC–ALMCODE (68, *y*, 70–71)	28 (to integer)
	• 2029	• 2229	• 2429	• Coriolis No Communication Alarm	
	• 2030	• 2230	• 2430	• Alarm Code	
8	2031–2031	2231–2231	2431–2431	UDP68 *x*, DMSMD (68, *y*, 74) • Density Measurement Mode	28 (to integer)
9	2032–2033	2232–2233	2432–2433	UDP68 *x*, PVMODE–WMSEL (68, *y*, 92–93)	28 (to integer)
	• 2032	• 2232	• 2432	• DDR Previous Mode	
	• 2033	• 2233	• 2433	• Water Monitor Select	
10	2040–2061	2240–2261	2440–2461	UDP68 *x*, CDGVAL–WMLDB (68, *y*, 20–30)	70 (to float)
	• 2040–2041	• 2240–2241	• 2440–2441	• Coriolis Drive Gain Value	
	• 2042–2043	• 2242–2243	• 2442–2443	• Coriolis Mass Value	
	• 2044–2045	• 2244–2245	• 2444–2445	• Density Value	
	• 2046–2047	• 2246–2247	• 2446–2447	• Static Pressure Value	
	• 2048–2049	• 2248–2249	• 2448–2449	• Temperature Value	
	• 2050–2051	• 2250–2251	• 2450–2451	• Low Water Monitor Value	
	• 2052–2053	• 2252–2253	• 2452–2453	• High Water Monitor Value	
	• 2054–2055	• 2254–2255	• 2454–2455	• Low Mass Flow Cutoff	
	• 2056–2057	• 2256–2257	• 2456–2457	• Low Water Monitor Limit	
	• 2058–2059	• 2258–2259	• 2458–2459	• High Water Monitor Limit	
	• 2060–2061	• 2260–2261	• 2460–2461	• Water Monitors Limit Tolerance	

Table 9-4 Predefined Modbus register ranges – Modbus Register Tables 2–4 *continued*

	Modbus addresses				
Index	**NOC Meter 1 (Table 2)**	**NOC Meter 2 (Table 3)**	**NOC Meter 3 (Table 4)**	**NOC TLPs and data[1]**	**Conversion**
11	2062–2121	2262–2321	2462–2521	UDP68 *x*, IMFW–AVWCA (68, *y*, 33–62)	70 (to float)
	• 2062–2063	• 2262–2263	• 2462–2463	• Instant Mass Flow	
	• 2064–2065	• 2264–2265	• 2464–2465	• Instant Gross Oil Volume Flow	
	• 2066–2067	• 2266–2267	• 2466–2467	• Instant Gross Water Volume Flow	
	• 2068–2069	• 2268–2269	• 2468–2469	• Instant Gross Free Water Volume Flow	
	• 2070–2071	• 2270–2271	• 2470–2471	• Instant Gross Liquid Volume Flow	
	• 2072–2073	• 2272–2273	• 2472–2473	• Instant Net Oil Vol Flow	
	• 2074–2075	• 2274–2275	• 2474–2475	• Instant Net Water Volume Flow	
	• 2076–2077	• 2276–2277	• 2476–2477	• Instant Net Free Water Volume Flow	
	• 2078–2079	• 2278–2279	• 2478–2479	• Instant Net Liquid Volume Flow	
	• 2080–2081	• 2280–2281	• 2480–2481	• Instant Water Cut Calculated	
	• 2082–2083	• 2282–2283	• 2482–2483	• Instant Water Cut Measured	
	• 2084–2085	• 2284–2285	• 2484–2485	• Instant Water Cut Applied	
	• 2086–2087	• 2286–2287	• 2486–2487	• Total Time	
	• 2088–2089	• 2288–2289	• 2488–2489	• Total Gross Oil	
	• 2090–2091	• 2290–2291	• 2490–2491	• Total Gross Water	
	• 2092–2093	• 2292–2293	• 2492–2493	• Total Gross Free Water	
	• 2094–2095	• 2294–2295	• 2494–2495	• Total Gross Liquid	
	• 2096–2097	• 2296–2297	• 2496–2497	• Total Net Oil	
	• 2098–2099	• 2298–2299	• 2498–2499	• Total Net Water	
	• 2100–2101	• 2300–2301	• 2500–2501	• Total Net Free Water	
	• 2102–2103	• 2302–2303	• 2502–2503	• Total Net Liquid	
	• 2104–2105	• 2304–2305	• 2504–2505	• Average Gross Oil Volume Flow	
	• 2106–2107	• 2306–2307	• 2506–2507	• Average Gross Water Volume Flow	
	• 2108–2109	• 2308–2309	• 2508–2509	• Average Gross Free Water Volume Flow	
	• 2110–2111	• 2310–2311	• 2510–2511	• Average Gross Liquid Volume Flow	
	• 2112–2113	• 2312–2313	• 2512–2513	• Average Net Oil Vol Flow	
	• 2114–2115	• 2314–2315	• 2514–2515	• Average Net Water Volume Flow	
	• 2116–2117	• 2316–2317	• 2516–2517	• Average Net Free Water Volume Flow	
	• 2118–2119	• 2318–2319	• 2518–2519	• Average Net Liquid Volume Flow	
	• 2120–2121	• 2320–2321	• 2520–2521	• Average Water Cut Applied	

Table 9-4 Predefined Modbus register ranges – Modbus Register Tables 2–4 *continued*

Index	Modbus addresses: NOC Meter 1 (Table 2)	Modbus addresses: NOC Meter 2 (Table 3)	Modbus addresses: NOC Meter 3 (Table 4)	NOC TLPs and data[1]	Conversion
12	2122–2129	2322–2329	2522–2529	UDP68 *x*, LFWALM–CALVAL (68, *y*, 66–69)	70 (to float)
	• 2122–2123	• 2322–2323	• 2522–2523	• Low Flow Rate Alarm Value	
	• 2124–2125	• 2324–2325	• 2524–2525	• High Flow Rate Alarm Value	
	• 2126–2127	• 2326–2327	• 2526–2527	• Flow Rate Alarm Deadband	
	• 2128–2129	• 2328–2329	• 2528–2529	• Coriolis Alarm Dword (two registers)	
13	2130–2163	2330–2363	2530–2563	UDP68 *x*, APCOD–WCTMP (68, *y*, 75–91)	70 (to float)
	• 2130–2131	• 2330–2331	• 2530–2531	• API Pressure Compensated Oil Density	
	• 2132–2133	• 2332–2333	• 2532–2533	• Instant Reverse Mass Flow	
	• 2134–2135	• 2334–2335	• 2534–2535	• Instant Reverse Gross Liquid Flow	
	• 2136–2137	• 2336–2337	• 2536–2537	• Total Reverse Time	
	• 2138–2139	• 2338–2339	• 2538–2539	• Total Mass	
	• 2140–2141	• 2340–2341	• 2540–2541	• Total Reverse Mass	
	• 2142–2143	• 2342–2343	• 2542–2543	• Total Reverse Gross Liquid	
	• 2144–2145	• 2344–2345	• 2544–2545	• Average Mass Flow	
	• 2146–2147	• 2346–2347	• 2546–2547	• Average Reverse Mass Flow	
	• 2148–2149	• 2348–2349	• 2548–2549	• Average Reverse Gross Liquid Flow	
	• 2150–2151	• 2350–2351	• 2550–2551	• Average Density	
	• 2152–2153	• 2352–2353	• 2552–2553	• Average Temperature	
	• 2154–2155	• 2354–2355	• 2554–2555	• Net Oil Density DDR	
	• 2156–2157	• 2356–2357	• 2556–2557	• Net Water Density DDR	
	• 2158–2159	• 2358–2359	• 2558–2559	• DDR Test Time	
	• 2160–2161	• 2360–2361	• 2560–2561	• DDR Test Time Remaining	
	• 2162–2163	• 2362–2363	• 2562–2563	• DDR Water Cut Temperature	
14	2164–2165	2364–2365	2564–2565	UDP68 *x*, DRVGL (68, *y*, 5) • TBR Drive Gain Setpoint	70 (to float)

(1) x represents the point number of the NOC Meter in TLP text format (1–3); y represents the point number of the NOC Meter in TLP numeric format (0–2).

Table 9-5 Predefined Modbus register ranges – Modbus Register Table 5

Index	Modbus addresses	NOC TLPs and data	Conversion
1	1500–1509	UDP70 1, TAG (70, 0, 0) • Point Tag ID (10-character string)	0 (none)
2	500–509	UDP70 1, MUNITS–TSTSTAT (70, 0, 1–10)	28 (to integer)
	• 500	• Mass Units	
	• 501	• Gas Volume Units	
	• 502	• Liquid Volume Units	
	• 503	• Density Units	
	• 504	• Temperature Units	
	• 505	• Pressure Units	
	• 506	• Base Temperature Option	
	• 507	• Time Base	
	• 508	• Operation Mode	
	• 509	• Test Status	
3	510–510	UDP70 1, WELLLIDX (70, 0, 12) • Well Selected (Index)	28 (to integer)

Table 9-5 Predefined Modbus register ranges – Modbus Register Table 5 *continued*

Index	Modbus addresses	NOC TLPs and data	Conversion
4	511–514 • 511 • 512 • 513 • 514	UDP70 1, RECMD–RECSTAT (70, 0, 14–17) • Recalc Mode • Current Record (two registers) • Recalc Save Mode • Recalc Status	28 (to integer)
5	515–515	UDP70 1, RCIDX (70, 0, 41) • Recalculated Test Index	28 (to integer)
6	516–525 • 516 • 517 • 518 • 519 • 520 • 521 • 522 • 523 • 524 • 525	UDP70 1, R01IDX–R10IDX (70, 0, 76–85) • Index for Recalculable Test 1 • Index for Recalculable Test 2 • Index for Recalculable Test 3 • Index for Recalculable Test 4 • Index for Recalculable Test 5 • Index for Recalculable Test 6 • Index for Recalculable Test 7 • Index for Recalculable Test 8 • Index for Recalculable Test 9 • Index for Recalculable Test 10	28 (to integer)
7	1510–1555 • 1510–1511 • 1512–1513 • 1514–1515 • 1516–1517 • 1518–1519 • 1520–1521 • 1522–1523 • 1524–1525 • 1526–1527 • 1528–1529 • 1530–1531 • 1532–1533 • 1534–1535 • 1536–1537 • 1538–1539 • 1540–1541 • 1542–1543 • 1544–1545 • 1546–1547 • 1548–1549 • 1550–1551 • 1552–1553 • 1554–1555	UDP70 1, TOTIME–PCOD (70, 0, 18–40) • Current Recalc Total Time • Current Recalc TBR Time • Current Recalc Pause Time • Current Recalc Total Gas • Current Recalc Total Gross Oil • Current Recalc Total Gross Water • Current Recalc Total Gross Free Water • Current Recalc Total Gross Liquid • Current Recalc Total Net Oil • Current Recalc Total Net Water • Current Recalc Total Net Free Water • Current Recalc Total Net Liquid • Current Recalc Average Gas Flow Rate • Current Recalc Average Water Cut Applied • Current Recalc Average Gross Oil • Current Recalc Average Gross Water • Current Recalc Average Gross Free Water • Current Recalc Average Gross Liquid • Current Recalc Average Net Oil • Current Recalc Average Net Water • Current Recalc Average Net Free Water • Current Recalc Average Net Liquid • API Pressure Compensated Oil Density	70 (to float)
8	1556–1563 • 1556–1557 • 1558–1559 • 1560–1561 • 1562–1563	UDP70 1, DBODEN–RCWDEN (70, 0, 42–45) • Database Oil Density • Database Water Density • Recalc Oil Density • Recalc Water Density	70 (to float)
10	1570–1579	UDP70 1, R1WTAG (70, 0, 46) • Recalculable Test 1 Well Tag (10-character string)	0 (none)
11	1580–1583 • 1580–1581 • 1582–1583	UDP70 1, R1STM–R2ETM (70, 0, 47–48) • Recalculable Test 1 Start Time • Recalculable Test 1 End Time	70 (to float)
12	1590–1599	UDP70 1, R2WTAG (70, 0, 49) • Recalculable Test 2 Well Tag (10-character string)	0 (none)

Table 9-5 Predefined Modbus register ranges – Modbus Register Table 5 *continued*

Index	Modbus addresses	NOC TLPs and data	Conversion
13	1600–1603 • 1600–1601 • 1602–1603	UDP70 1, R2STM–R2ETM (70, 0, 50–51) • Recalculable Test 2 Start Time • Recalculable Test 2 End Time	70 (to float)
14	1610–1619	UDP70 1, R3WTAG (70, 0, 52) • Recalculable Test 3 Well Tag (10-character string)	0 (none)
15	1620–1623 • 1620–1621 • 1622–1623	UDP70 1, R3STM–R3ETM (70, 0, 53–54) • Recalculable Test 3 Start Time • Recalculable Test 3 End Time	70 (to float)

Table 9-6 Predefined Modbus register ranges – Modbus Register Table 6

Index	Modbus addresses	NOC TLPs and data	Conversion
1	1630–1639	UDP70 1, R4WTAG (70, 0, 55) • Recalculable Test 4 Well Tag (10-character string)	0 (none)
2	1640–1643 • 1640–1641 • 1642–1643	UDP70 1, R4STM–R4ETM (70, 0, 56–57) • Recalculable Test 4 Start Time • Recalculable Test 4 End Time	70 (to float)
3	1650–1659	UDP70 1, R5WTAG (70, 0, 58) • Recalculable Test 5 Well Tag (10-character string)	0 (none)
4	1660–1663 • 1660–1661 • 1662–1663	UDP70 1, R5STM–R5ETM (70, 0, 59–60) • Recalculable Test 5 Start Time • Recalculable Test 5 End Time	70 (to float)
5	1670–1679	UDP70 1, R6WTAG (70, 0, 61) • Recalculable Test 6 Well Tag (10-character string)	0 (none)
6	1680–1683 • 1680–1681 • 1682–1683	UDP70 1, R6STM–R6ETM (70, 0, 62–63) • Recalculable Test 6 Start Time • Recalculable Test 6 End Time	70 (to float)
7	1690–1699	UDP70 1, R7WTAG (70, 0, 64) • Recalculable Test 7 Well Tag (10-character string)	0 (none)
8	1700–1703 • 1700–1701 • 1702–1703	UDP70 1, R7STM–R7ETM (70, 0, 65–66) • Recalculable Test 7 Start Time • Recalculable Test 7 End Time	70 (to float)
9	1710–1719	UDP70 1, R8WTAG (70, 0, 67) • Recalculable Test 8 Well Tag (10-character string)	0 (none)
10	1720–1723 • 1720–1721 • 1722–1723	UDP70 1, R8STM–R8ETM (70, 0, 68–69) • Recalculable Test 8 Start Time • Recalculable Test 8 End Time	70 (to float)
11	1730–1739	UDP70 1, R9WTAG (70, 0, 70) • Recalculable Test 9 Well Tag (10-character string)	0 (none)
12	1740–1743 • 1740–1741 • 1742–1743	UDP70 1, R9STM–R9ETM (70, 0, 71–72) • Recalculable Test 9 Start Time • Recalculable Test 9 End Time	70 (to float)
13	1750–1759	UDP70 1, R10WTAG (70, 0, 73) • Recalculable Test 10 Well Tag (10-character string)	0 (none)
14	1760–1763 • 1760–1761 • 1762–1763	UDP70 1, R10STM–R10ETM (70, 0, 74–75) • Recalculable Test 10 Start Time • Recalculable Test 10 End Time	70 (to float)

Table 9-7 Predefined Modbus register ranges – Modbus Register Tables 7–10

	Modbus addresses					
Index	**MMI #1**	**MMI #2**	**MMI #3**	**MMI #4**	**NOC TLPs and data[1]**	**Conversion**
1	3000–3009	3200–3209	3400–3409	3600–3609	UDP71 *x*, TAG–R245 (71, *y*, 0) • Point Tag ID (10-character string)	0 (none)
2	3010–3011	3210–3211	3410–3411	3610–3611	UDP71 *x*, DPRSCO–MPRSCO (71, *y*, 1–2)	28 (to integer)
	• 3010	• 3210	• 3310	• 3410	• Density Press Compensation Option	
	• 3011	• 3211	• 3311	• 3411	• Mass Press Compensation Option	
3	3012–3014	3212–3214	3412–3414	3612–3614	UDP71 *x*, MADDR–COMST (71, *y*, 6–8)	28 (to integer)
	• 3012	• 3212	• 3412	• 3612	• Device Modbus Address	
	• 3013	• 3213	• 3413	• 3613	• Scanning Mode	
	• 3014	• 3214	• 3414	• 3614	• Communications Status	
4	3015–3016	3215–3216	3415–3416	3615–3616	UDP71 *x*, ALSH1–ALSH2 (71, *y*, 33–34)	0 (none)
	• 3015	• 3215	• 3415	• 3615	• Coriolis Alarm MS Word	
	• 3016	• 3216	• 3416	• 3616	• Coriolis Alarm LS Word	
5	3020–3023	3220–3223	3420–3423	3620–3623	UDP71 *x*, DPRSCC–MPRSCC (71, *y*, 3–4)	70 (to float)
	• 3020–3021	• 3220–3221	• 3420–3421	• 3620–3621	• Density Press Compensation Coeff	
	• 3022–3023	• 3222–3223	• 3422–3423	• 3622–3623	• Mass Press Compensation Coeff	
6	3024–3071	3224–3271	3424–3471	3624–3671	UDP71 *x*, R245–R291 (71, *y*, 9–32)	70 (to float)
	• 3024–3025	• 3224–3225	• 3424–3425	• 3624–3625	• Alarms Reg 245	
	• 3026–3027	• 3226–3227	• 3426–3427	• 3626–3627	• Mass Flowrate Reg 247	
	• 3028–3029	• 3228–3229	• 3428–3429	• 3628–3629	• Density Reg 249	
	• 3030–3031	• 3230–3231	• 3430–3431	• 3630–3631	• Temperature Reg 251	
	• 3032–3033	• 3232–3233	• 3432–3433	• 3632–3633	• Vol Flowrate Reg 253	
	• 3034–3035	• 3234–3235	• 3434–3435	• 3634–3635	• Viscosity Unused Reg 255	
	• 3036–3037	• 3236–3237	• 3436–3437	• 3636–3637	• Internal Derived Pressure Reg 257	
	• 3038–3039	• 3238–3239	• 3438–3439	• 3638–3639	• Mass Total Reg 259	
	• 3040–3041	• 3240–3241	• 3440–3441	• 3640–3641	• Vol Total Reg 261	
	• 3042–3043	• 3242–3243	• 3442–3443	• 3642–3643	• Mass Inventory Reg 263	
	• 3044–3045	• 3244–3245	• 3444–3445	• 3644–3645	• Vol Inventory Reg 265	
	• 3046–3047	• 3246–3247	• 3446–3447	• 3646–3647	• Press Correction Factor Flow Reg 267	
	• 3048–3049	• 3248–3249	• 3448–3449	• 3648–3649	• Press Correction Factor Density Reg 269	
	• 3050–3051	• 3250–3251	• 3450–3451	• 3650–3651	• Flow Calibration Press Reg 271	
	• 3052–3053	• 3252–3253	• 3452–3453	• 3652–3653	• Press Input at 4 mA Reg 273	
	• 3054–3055	• 3254–3255	• 3454–3455	• 3654–3655	• Press Input at 20 mA Reg 275	
	• 3056–3057	• 3256–3257	• 3456–3457	• 3656–3657	• Density Value for FD Calibration Reg 277	
	• 3058–3059	• 3258–3259	• 3458–3459	• 3658–3659	• Mass Rate Factor Reg 279	
	• 3060–3061	• 3260–3261	• 3460–3461	• 3660–3661	• Volume Rate Factor Reg 281	
	• 3062–3063	• 3262–3263	• 3462–3463	• 3662–3663	• Density Factor Reg 283	
	• 3064–3065	• 3264–3265	• 3464–3465	• 3664–3665	• Raw Tube Frequency Reg 285	
	• 3066–3067	• 3266–3267	• 3466–3467	• 3666–3667	• Left PickOff Voltage Reg 287	
	• 3068–3069	• 3268–3269	• 3468–3469	• 3668–3669	• Right PickOff Voltage Reg 289	
	• 3070–3071	• 3270–3271	• 3470–3471	• 3670–3671	• Coriolis Drive Gain Reg 291	

Table 9-7 Predefined Modbus register ranges – Modbus Register Tables 7–10 *continued*

Index	Modbus addresses MMI #1	MMI #2	MMI #3	MMI #4	NOC TLPs and data[1]	Conversion
7	3072–3097	3272–3297	3472–3497	3672–3697	UDP71 *x*, NGMSG–R265CU (71, *y*, 35–47)	70 (to float)
	• 3072–3073	• 3272–3273	• 3472–3473	• 3672–3673	• Num Good Messages	
	• 3074–3075	• 3274–3275	• 3474–3475	• 3674–3675	• Num Bad Messages	
	• 3076–3077	• 3276–3277	• 3476–3477	• 3676–3677	• Poll Speed	
	• 3078–3079	• 3278–3279	• 3478–3479	• 3678–3679	• Press Corrected Mass	
	• 3080–3081	• 3280–3281	• 3480–3481	• 3680–3681	• Press Corrected Density	
	• 3082–3083	• 3282–3283	• 3482–3483	• 3682–3683	• Mass Flowrate Converted Units	
	• 3084–3085	• 3284–3285	• 3484–3485	• 3684–3685	• Density Converted Units	
	• 3086–3087	• 3286–3287	• 3486–3487	• 3686–3687	• Temperature Converted Units	
	• 3088–3089	• 3288–3289	• 3488–3489	• 3688–3689	• Vol Flowrate Converted Units	
	• 3090–3091	• 3290–3291	• 3490–3491	• 3690–3691	• Mass Total Converted Units	
	• 3092–3093	• 3292–3293	• 3492–3493	• 3692–3693	• Volume Total Converted Units	
	• 3094–3095	• 3294–3295	• 3494–3495	• 3694–3695	• Mass Inventory Converted Units	
	• 3096–3097	• 3296–3297	• 3496–3497	• 3696–3697	• Volume Inventory Converted Units	
8	3017–3017	3217–3217	3417–3417	3617–3617	UDP71 *x*, WCMD (71, *y*, 49) • Write Command	0 (none)

(1) x represents the point number of the MMI Interface in TLP text format (1–4); y represents the point number of the MMI Interface in TLP numeric format (0–3).

Table 9-8 Predefined Modbus register ranges – Modbus Register Table 11

Index	Modbus addresses	NOC TLPs and data	Conversion
1	4000–4999	UDP69 *x*, TAG (69, *y*, 0) • Well tag of Well *x* (Well *y*) (20-character string)	0 (none)
2	5000–5049	UDP69 *x*, HRECR (69, *y*, 7) • History record to retrieve for Well *x* (Well *y*)	28 (to integer)
3	5100–5199	UDP69 *x*, OILDEN (69, *y*, 1) • Oil density of Well *x* (Well *y*)	70 (to float)
4	5200–5299	UDP69 *x*, OILDEN (69, *y*, 2) • Water density of Well *x* (Well *y*)	70 (to float)
5	5300–5999	UDP69 *x*, OILDEN (69, *y*, 6) • Purge time for Well *x* (Well *y*)	70 (to float)

Table 9-9 Predefined Modbus register ranges – Modbus Register Tables 12–15

	Modbus addresses					
Index	**Wells 1–15**	**Wells 16–30**	**Wells 31–45**	**Wells 46–50**	**NOC TLPs and data[1]**	**Conversion**
1	6100–6199	7600–7699	9100–9199	10600–10699	UDP69 *x*, TSTM–TRMSR (69, *y*, 8–57) • Test Start Date and Time • Test End Date and Time • Last Recalculation Date and Time • Test Duration • Test Purge Time • TBR Time • TMR Time • Test Pause Time • Base Temperature Option Initial • Water Cut Initial • Total Gas Initial • Gas to Oil Ratio Initial • Average Gas Flow Rate Initial • Total Gross Oil Initial • Total Gross Water Initial • Total Gross Free Water Initial • Total Net Oil Initial • Total Net Water Initial • Total Net Free Water Initial • Average Gross Oil Initial • Average Gross Water Initial • Average Gross Free Water Initial • Average Net Oil Initial • Average Net Water Initial • Average Net Free Water Initial • Base Temperature Option Recalculated • Water Cut Recalculated • Total Gas Recalculated • Gas to Oil Ratio Recalculated • Average Gas Flow Rate Recalculated • Total Gross Oil Recalculated • Total Gross Water Recalculated • Total Gross Free Water Recalculated • Total Net Oil Recalculated • Total Net Water Recalculated • Total Net Free Water Recalculated • Average Gross Oil Recalculated • Average Gross Water Recalculated • Average Gross Free Water Recalculated • Average Net Oil Recalculated • Average Net Water Recalculated • Average Net Free Water Recalculated • Total Mass Initial • Total Reverse Mass Initial • Total Mass Recalculated • Total Reverse Mass Recalculated • Average Density Initial • Average Temperature Initial • Average Density Recalculated • Average Temperature Recalculated	70 (to float)
2	6200–6299	7700–7799	9200–9299	10700–10799		70 (to float)
3	6300–6399	7800–7899	9300–9399	10800–10899		70 (to float)
4	6400–6499	7900–7999	9400–9499	10900–10999		70 (to float)
5	6500–6599	8000–8099	9500–9599	11000–11099		70 (to float)
6	6600–6699	8100–8199	9600–9699	N/A		70 (to float)
7	6700–6799	8200–8299	9700–9799	N/A		70 (to float)
8	6800–6899	8300–8399	9800–9899	N/A		70 (to float)
9	6900–6999	8400–8499	9900–9999	N/A		70 (to float)
10	7000–7099	8500–8599	10000–10099	N/A		70 (to float)
11	7100–7199	8600–8699	10100–10199	N/A		70 (to float)
12	7200–7299	8700–8799	10200–10299	N/A		70 (to float)
13	7300–7399	8800–8899	10300–10399	N/A		70 (to float)
14	7400–7499	8900–8999	10400–10499	N/A		70 (to float)
15	7500–7599	9000–9099	10500–10599	N/A		70 (to float)

(1) x represents the point number of the well in TLP text format (1–50); y represents the point number of the well in TLP numeric format (0–49).

Chapter 10
Maintenance and Troubleshooting

10.1 About this chapter

This chapter provides information and procedures for NOC system maintenance and troubleshooting. Topics include:

- Connecting from ROCLINK 800 to the ROC809 platform – see Section 10.2
- Alarms – see Section 10.3
- Checking process variables and test points – see Section 10.4
- Checking slug flow – see Section 10.5
- Checking the characterization – see Section 10.6
- Checking the calibration – see Section 10.7
- Diagnosing wiring problems – see Section 10.8
- Checking the test points – see Section 10.9
- Checking the core processor – see Section 10.10
- Checking sensor coils – see Section 10.11

For additional maintenance and troubleshooting information, see the manual entitled *ROCLINK 800 Configuration Software: User Manual*.

10.2 Connecting from ROCLINK 800 to the ROC809 platform

If you are having trouble connecting from ROCLINK 800 to the ROC809 platform:

1. Check the cable and wiring.
2. If you are not using the Direct Connect connection type, check the ROCLINK 800 communication parameters.
3. Try connecting through the LOI with the Direct Connect connection type.
4. Check the COM port configuration on your PC.
5. Reboot the PC and retry.

10.3 Alarms

In the NOC system, there are several alarm types:

- Status alarms – Alarms from the Micro Motion sensor or core processor. These alarms are displayed on the MMI Interface display, Alarms panel. They are not written to the ROC809 alarm log, and Report by Exception cannot be implemented for these alarms. For more information on status alarms, see Section 10.3.1.
- Flow alarms – Alarms from the NOC Meter. These alarms are displayed on the NOC Station display, Alarms panel, or the NOC Meter display, Alarms panel. These alarms are not written to the ROC809 alarm log. Report by Exception can be implemented for these alarms. For more information on flow alarms, see Section 4.4.7.
- I/O alarms – Alarms from the ROC809 platform. These alarms are written to the ROC809 alarm log. Report by Exception can be implemented for these alarms. For more information on I/O alarms, see the manual entitled *ROCLINK 800 Configuration Software: User Manual*.

10.3.1 Status alarms

To view a list of active status alarm codes, open the Alarms panel of the MMI Interface associated with the specific sensor or core processor (see Figure 4-10). A list of status alarms and possible remedies is provided in Table 10-1.

Table 10-1 Status alarms and remedies

Alarm code	Message	Possible remedy
A001	EEPROM Checksum Error (CP)	Cycle power to the meter.
		The meter might need service. Contact Micro Motion.
A002	RAM Error (CP)	Cycle power to the meter.
		The meter might need service. Contact Micro Motion.
A003	Sensor Failure	Check the test points. See Section 10.9.
		Check the sensor coils. See Section 10.11.
		Check wiring to sensor. See Section 10.8.2.
		Check for slug flow. See Section 10.5.
		Check sensor tubes.
A004	Temperature Sensor Failure	Check the test points. See Section 10.9.
		Check the sensor RTD reading(s). See Section 10.11.
		Check wiring to sensor. See Section 10.8.2.
		Verify meter characterization. See Section 10.6.
		Verify that process temperature is within range of sensor.
		Contact Micro Motion.
A005	Input Overrange	Check the test points. See Section 10.9.
		Check the sensor coils. See Section 10.11.
		Verify process.
		Make sure that the appropriate measurement unit is configured.
		Verify calibration factors in core processor configuration. See Section 10.6.
		Re-zero the sensor. See Section 10.7.

Table 10-1 Status alarms and remedies *continued*

Alarm code	Message	Possible remedy
A006	Xmtr Not Config	Check the characterization. Specifically, verify the FCF and K1 values.
		Contact your system supplier.
A008	Density Overrange	Check the test points. See Section 10.9.
		Check the sensor coils. See Section 10.11.
		Verify process. Check for air in the flow tubes, tubes not filled, foreign material in tubes, or coating in tubes.
		Verify core processor characterization. See Section 10.6.
		Perform density calibration. See Section 10.7.
A009	Xmtr Initializing/ Warming Up	No action required. Allow the meter to warm up. The error should disappear once the meter is ready for normal operation. If alarm does not clear: • Make sure that the sensor is completely full or completely empty. • Verify sensor configuration parameters in core processor configuration. • Verify wiring to sensor.
A010	Zero Failed	If alarm appears during a zero procedure, ensure that there is no flow through the sensor, then retry.
		Cycle power to the meter, then retry.
A011	Zero Too Low	Ensure that there is no flow through the sensor, then retry.
		Cycle power to the sensor, then retry.
A012	Zero Too High	Ensure that there is no flow through the sensor, then retry.
		Cycle power to the sensor, then retry.
A104	Calibration in Progress	No action required.
A105	Slug Flow	See Section 10.5.
A107	Power Reset	No action required.

10.4 Checking process variables and test points

Micro Motion suggests that, for each Micro Motion sensor, you make a record of the raw process variables and test points listed below, under normal operating conditions. This will help you recognize when the values are unusually high or low.

- Flow rate
- Density
- Left pickoff voltage
- Right pickoff voltage
- Drive gain

These are displayed on the MMI Interface Registers panel (see Figure 4-9).

For troubleshooting, check the variables under both normal flow and tubes-full no-flow conditions. Unusual values may indicate a variety of different problems. Table 10-2 lists several possible problems and remedies.

Table 10-2 Process variables problems and possible remedies

Symptom	Cause	Possible remedy
Steady non-zero flow rate under no-flow conditions	Misaligned piping (especially in new installations)	Correct the piping.
	Open or leaking valve	Check or correct the valve mechanism.
	Bad sensor zero	Rezero the meter. See Section 10.7.
	Bad flow calibration factor	Verify characterization. See Section 10.6.
Erratic non-zero flow rate under no-flow conditions	RF interference	Check environment for RF interference.
	Wiring problem	Verify all sensor wiring and ensure the wires are making good contact.
	Vibration in pipeline at rate close to sensor tube frequency	Check environment and remove source of vibration.
	Leaking valve or seal	Check pipeline.
	Inappropriate damping value	Check core processor configuration. See the manual entitled *Micro Motion Net Oil Computer Software and NOC System: Installation Manual*.
	Slug flow	See Section 10.5.
	Plugged flow tube	Check drive gain and tube frequency. Purge the flow tubes or replace the sensor.
	Moisture in sensor junction box	Open junction box and allow it to dry. Do not use contact cleaner. When closing, ensure integrity of gaskets and O-rings, and grease all O-rings.
	Mounting stress on sensor	Check sensor mounting. Ensure: • Sensor is not being used to support pipe. • Sensor is not being used to correct pipe misalignment. • Sensor is not too heavy for pipe.
	Sensor cross-talk	Check environment for sensor with similar (±0.5 Hz) tube frequency.
	Incorrect sensor orientation	Sensor orientation must be appropriate to process fluid. See the installation manual for your sensor.
Erratic non-zero flow rate when flow is steady	Inappropriate damping value	Check core processor configuration. See the manual entitled *Micro Motion Net Oil Computer Software and NOC System: Installation Manual*.
	Excessive or erratic drive gain	See Section 10.9.2.
	Slug flow	See Section 10.5.
	Plugged flow tube	Check drive gain and tube frequency. Purge the flow tubes or replace the sensor.
	Wiring problem	Verify all sensor wiring and ensure the wires are making good contact.

Table 10-2 Process variables problems and possible remedies *continued*

Symptom	Cause	Possible remedy
Inaccurate flow rate	Bad flow calibration factor	Verify characterization. See Section 10.6.
	Bad sensor zero	Rezero the meter. See Section 10.7.
	Bad density calibration factors	Verify characterization. See Section 10.6.
	Bad meter grounding	See Section 10.8.3.
	Slug flow	See Section 10.5.
	Wiring problem	Verify all sensor wiring and ensure the wires are making good contact.
Inaccurate density reading	Problem with process fluid	Use standard procedures to check quality of process fluid.
	Bad density calibration factors	Verify characterization. See Section 10.6.
	Wiring problem	Verify all sensor wiring and ensure the wires are making good contact.
	Bad meter grounding	See Section 10.8.3.
	Slug flow	See Section 10.5.
	Sensor cross-talk	Check environment for sensor with similar (±0.5 Hz) tube frequency.
	Plugged flow tube	Check drive gain and tube frequency. Purge the flow tubes or replace the sensor.
Temperature reading significantly different from process temperature	RTD failure	Check for alarm conditions and follow troubleshooting procedure for indicated alarm. Ensure “Use external temperature” is disabled in core processor. See the manual entitled *Micro Motion Net Oil Computer Software and NOC System: Installation Manual*.
	Incorrect calibration factor	Verify that the temperature calibration factor is set correctly in the core processor.
	Temperature incorrectly configured	Verify temperature source configuration. See Section 5.6.
Temperature reading slightly different from process temperature	Temperature calibration required	Contact your system supplier.
Unusually high density reading	Plugged flow tube	Check drive gain and tube frequency. Purge the flow tubes or replace the sensor.
	Incorrect K2 value	Verify characterization. See Section 10.6.
Unusually low density reading	Slug flow	See Section 10.5.
	Incorrect K2 value	Verify characterization. See Section 10.6.
Unusually high tube frequency	Sensor erosion	Contact Micro Motion.
Unusually low tube frequency	Plugged flow tube	Purge the flow tubes or replace the sensor.
Unusually low pickoff voltages	Several possible causes	See Section 10.9.2.
Unusually high drive gain	Several possible causes	See Section 10.9.2.

10.5 Checking slug flow

Slugs – gas in a liquid process or liquid in a gas process – occasionally appear in some applications. In the factory-supplied configuration file, slug flow detection is disabled. If you have enabled slug flow detection, and slug flow occurs:

- Check process for cavitation, flashing, or leaks.
- Change the sensor orientation.
- Monitor density.
- If desired, change the slug flow limits to accept a wider density range.
- If desired, change slug duration.

Slug flow parameters for each sensor are stored in the corresponding core processor. If you need to change the slug flow parameters, use ProLink II to connect to the core processor, as described in the manual entitled *Micro Motion Net Oil Computer Software and NOC System: Installation Manual*, and set the slug flow parameters appropriately for your process.

10.6 Checking the characterization

If the system appears to be operating correctly but sends inaccurate process data, an incorrect characterization could be the cause. Characterization parameters for each sensor are stored in the corresponding core processor. Verify the core processor configuration, as described in the manual entitled *Micro Motion Net Oil Computer Software and NOC System: Installation Manual*.

10.7 Checking the calibration

Inaccurate calibration can produce inaccurate output values. If the system appears to be operating correctly but provides inaccurate process data, an inaccurate calibration may be the cause.

If it is necessary to calibrate an analog input or analog output on the ROC809 platform, see the manual entitled *ROCLINK 800 Configuration Software: User Manual*.

Micro Motion sensors were zeroed and calibrated for density at the factory, so it is usually not necessary to perform zero or density calibration procedures in the field. If you need to zero or calibrate a Micro Motion sensor, you must use ProLink II:

- Instructions for the zero procedure are provided in the manual entitled *Micro Motion Net Oil Computer Software and NOC System: Installation Manual*.
- Instructions for density calibration are provided in the manual entitled *ProLink II Software for Micro Motion Transmitters: Installation and Use Manual*.

Note: Micro Motion recommends using meter factors, rather than calibration, to prove the meter. Contact Micro Motion customer support for more information and before performing a calibration.

To calibrate other components of the NOC system (e.g., a pressure sensor), see the appropriate vendor documentation.

10.8 Diagnosing wiring problems

Use the procedures in this section to check the NOC system for wiring problems.

10.8.1 Checking the power supply wiring

To check the power supply wiring:

1. Power down the ROC809.
2. Verify power supply wiring. See the manual entitled *Micro Motion Net Oil Computer Software and NOC System: Installation Manual*.
3. Verify that the external power supply wires are making good contact, and are not clamped to the wire insulation.
4. Use a voltmeter to test the voltage at the ROC809 platform's power supply terminals. Verify that it is within the specified limits. You may need to size the cable. For power supply requirements, see the manual entitled *Micro Motion Net Oil Computer Software and NOC System: Installation Manual*.
5. Use a voltmeter to test the voltage at the I.S. barrier's power supply terminals. Verify that it is within the specified limits. You may need to size the cable. For power supply requirements, see the manual entitled *Micro Motion Net Oil Computer Software and NOC System: Installation Manual*.
6. Use a voltmeter to test the voltage at the I.S. barrier's output power terminals. The output with an open circuit (no connections) is nominally 15.3 VDC. With a core processor connected, the voltage is nominally 13.5 to 10.5 VDC. The actual value depends on sensor current draw:
   - 13.5 VDC with no sensor drive
   - 10.5 VDC with full sensor drive
7. Use a voltmeter to test the voltage at the core processor's power supply terminals. Voltage depends upon wiring resistance between the I.S. barrier and the core processor. The voltage at the core processor terminals must not drop below 9 VDC or the core processor will reset.

10.8.2 Checking the sensor-to-ROC809 wiring

To check the sensor-to-ROC809 wiring, verify that:

- The ROC809 is connected to the sensor according to the wiring information provided in the manual entitled *Micro Motion Net Oil Computer Software and NOC System: Installation Manual*.
- The wires are making good contact with the terminals.

If the wires are incorrectly connected:

1. Power down the ROC809.
2. If the I.S. barrier(s) are powered separately, power down the barrier(s).
3. Correct the wiring.
4. Restore power to the ROC809 and the I.S. barrier(s).

10.8.3 Checking grounding

The ROC809 platform must be grounded. The sensor may or may not require grounding. See the appropriate installation manual for grounding requirements and instructions.

10.9 Checking the test points

Some status alarms that indicate a sensor failure or overrange condition can be caused by problems other than a failed sensor. You can diagnose sensor failure or overrange status alarms by checking the meter test points. The *test points* include left and right pickoff voltages, drive gain, and tube frequency. These values describe the current operation of the sensor.

To read the current test point values, use the procedure described in Section 10.4.

10.9.1 Evaluating the test points

Use the following guidelines to evaluate the test points:

- If the drive gain is erratic, negative, or saturated, refer to Section 10.9.2.
- If the value for the left or right pickoff does not equal the appropriate value from Table 10-3, based on the sensor flow tube frequency, refer to Section 10.9.3.
- If the values for the left and right pickoffs equal the appropriate values from Table 10-3, based on the sensor flow tube frequency, record your troubleshooting data and contact Micro Motion for assistance.

Table 10-3 Sensor pickoff values

Sensor[1]	Pickoff value
ELITE Model CMF sensors	3.4 mV peak-to-peak per Hz based on sensor flow tube frequency
Model F025, F050, F100 sensors	3.4 mV peak-to-peak per Hz based on sensor flow tube frequency
Model F200 sensors (compact case)	2.0 mV peak-to-peak per Hz based on sensor flow tube frequency
Model F200 sensors (standard case)	3.4 mV peak-to-peak per Hz based on sensor flow tube frequency
Model H025, H050, H100 sensors	3.4 mV peak-to-peak per Hz based on sensor flow tube frequency
Model H200 sensors	2.0 mV peak-to-peak per Hz based on sensor flow tube frequency
Model R025, R050, or R100 sensors	3.4 mV peak-to-peak per Hz based on sensor flow tube frequency
Model R200 sensors	2.0 mV peak-to-peak per Hz based on sensor flow tube frequency
CMF400 I.S. sensors	2.7 mV peak-to-peak per Hz based on sensor flow tube frequency

(1) If your sensor is not listed, contact Micro Motion.

10.9.2 Drive gain problems

Problems with drive gain can appear in several different forms:

- Erratic drive gain (e.g., rapid shifting from positive to negative)
- Negative drive gain
- Saturated or excessive (near 100%) drive gain

See Table 10-4 for a list of possible problems and remedies.

Table 10-4 Drive gain problems, causes, and remedies

Cause	Possible remedy
Excessive slug flow	See Section 10.5.
Plugged flow tube	Purge the flow tubes or replace the sensor.

Table 10-4 Drive gain problems, causes, and remedies *continued*

Cause	Possible remedy
Cavitation or flashing	Increase inlet or back pressure at the sensor.
	If a pump is located upstream from the sensor, increase the distance between the pump and sensor.
Drive board or module failure, cracked flow tube, or sensor imbalance	Contact Micro Motion.
Mechanical binding at sensor	Ensure sensor is free to vibrate.
Open drive or left pickoff sensor pin	Contact Micro Motion.
Flow rate out of range	Ensure that flow rate is within sensor limits.
Wrong K1 and FCF characterization constants for sensor	Re-enter the K1 and FCF characterization constants. See Section 10.6.
Incorrect sensor type configured	Verify sensor characterization. See Section 10.6.
Polarity of pick-off reversed or polarity of drive reversed	Contact Micro Motion.

10.9.3 Low pickoff voltage

Low pickoff voltage can be caused by several problems. See Table 10-5.

Table 10-5 Low pickoff voltage causes and remedies

Cause	Possible remedy
Faulty wiring runs between the sensor and core processor	Verify wiring. See the manual entitled *Micro Motion Net Oil Computer Software and NOC System: Installation Manual*.
Process flow rate beyond the limits of the sensor	Verify that the process flow rate is not out of range of the sensor.
Slug flow	See Section 10.5.
No tube vibration in sensor	Check for plugging.
	Ensure sensor is free to vibrate (no mechanical binding).
	Verify wiring.
	Test coils at sensor. See Section 10.10.
Moisture in the sensor electronics	Eliminate the moisture in the sensor electronics.
The sensor is damaged	Contact Micro Motion.

10.10 Checking the core processor

Two core processor procedures are available:

- You can check the core processor LED. The core processor has an LED that indicates different meter conditions. See Table 10-6.
- You can perform the core processor resistance test to check for a damaged core processor.

10.10.1 Checking the core processor LED

To check the core processor LED:

1. Maintain power to the I.S. barrier.
2. Remove the core processor lid. The core processor is instrinsically safe and can be opened in all environments.
3. Check the core processor LED against the conditions described in Table 10-6.
4. To return to normal operation, replace the lid.

Note: When reassembling the meter components, be sure to grease all O-rings.

Table 10-6 Core processor LED behavior, meter conditions, and remedies

LED behavior	Condition	Possible remedy
1 flash per second (ON 25%, OFF 75%)	Normal operation	No action required.
1 flash per second (ON 75%, OFF 25%)	Slug flow	See Section 10.5.
Solid ON	Zero or calibration in progress	If calibration is in progress, no action required. If no calibration is in progress, contact Micro Motion.
	Core processor receiving between 11.5 and 5 volts	Verify power supply wiring. See Section 10.8.1.
3 rapid flashes, followed by pause	Sensor not recognized	Check wiring between ROC809 and sensor. See Section 10.8.2
	Improper configuration	Check sensor characterization parameters. See Section 10.6.
	Broken pin between sensor and core processor	Contact Micro Motion.
4 flashes per second	Fault condition	Check alarm status.
OFF	Core processor receiving less than 5 volts	• Verify power supply wiring. See Section 10.8.1. • If ROC809 LEDs are active, device is receiving power. Check voltage across terminals 1 (VDC+) and 2 (VDC–) in core processor. Normal reading is approximately 14 VDC. If reading is normal, internal core processor failure is possible. Contact Micro Motion. If reading is 0, internal device failure is possible. Contact Micro Motion. If reading is less than 1 VDC, verify power supply wiring to core processor. Wires may be switched. See Section 10.8.1. • If ROC809 LEDs are not active, first press the LED button. If they remain inactive, device is not receiving power. Check power supply. See Section 10.8.1. If power supply is operational, internal device failure is possible. Contact Micro Motion.
	Core processor internal failure	Contact Micro Motion.

10.10.2 Core processor resistance test

To perform the core processor resistance test:

1. Remove power from the core processor.
2. Remove the core processor lid.
3. Disconnect the 4-wire cable between the core processor and the I.S. barrier.
4. Measure the resistance between core processor terminals 3 and 4 (RS-485A and RS-485B). See Figure 10-1. Resistance should be 40 kΩ to 50 kΩ.

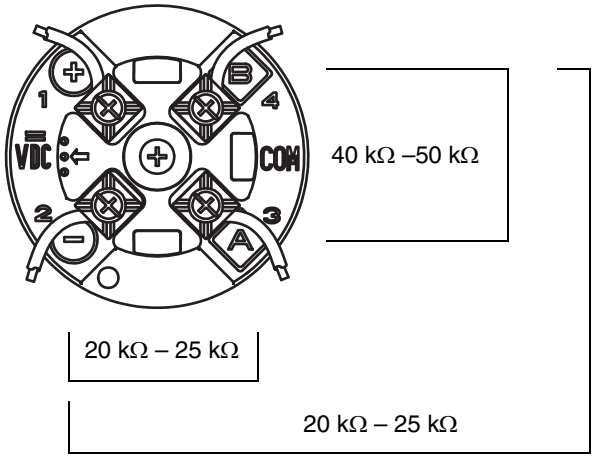
5. Measure the resistance between core processor terminals 2 and 3 (VDC– and RS-485A). Resistance should be 20 kΩ to 25 kΩ.
6. Measure the resistance between core processor terminals 2 and 4 (VDC– and RS-485B). Resistance should be 20 kΩ to 25 kΩ.
7. If any resistance measurements are lower than specified, the core processor may not be able to communicate with the ROC809. Contact Micro Motion.

To return to normal operation:

1. Reconnect the 4-wire cable between the core processor and the ROC809.
2. Replace the core processor lid.
3. Restore power.

Note: When reassembling the meter components, be sure to grease all O-rings.

Figure 10-1 Core processor resistance test



10.11 Checking sensor coils

Problems with sensor coils can cause several alarms, including sensor failure and a variety of out-of-range conditions. Testing the sensor coils involves testing the terminal pairs and testing for shorts to case.

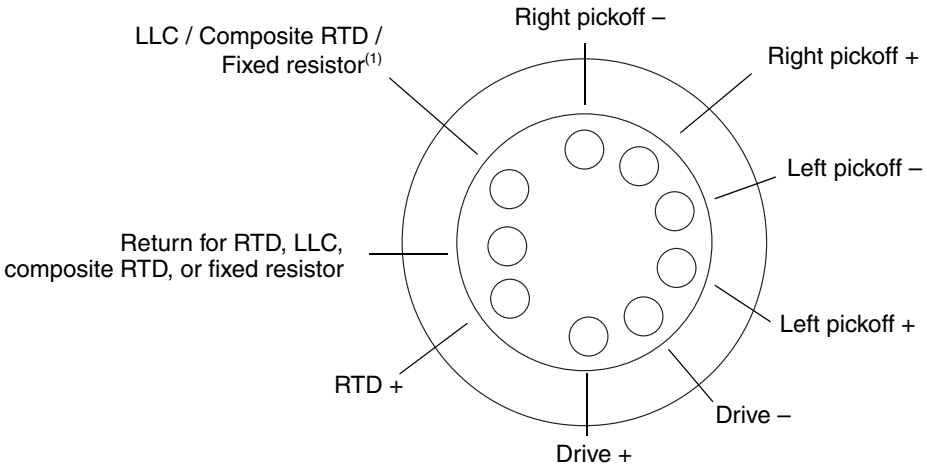
To test the sensor coils:

1. Remove power from the core processor.
2. Remove the core processor lid.

Note: You may disconnect the 4-wire cable between the core processor and the I.S. barrier, or leave it connected.

3. Loosen the captive screw (2.5 mm) in the center of the core processor. Carefully remove the core processor from the sensor by grasping it and lifting it straight up. **CAUTION! Do not twist or rotate the core processor when removing it. Do not bend the sensor pins.**
4. Using a digital multimeter (DMM), check the pickoff coil resistances by placing the DMM leads on the terminal pairs. Refer to Figure 10-2 to identify the pins and pin pairs. Record the values.

Figure 10-2 Sensor pins



(1) Lead length compensator (LLC) for all sensors except T-Series, CMF400 I.S., and F300. For T-Series sensors, functions as composite RTD. For CMF400 I.S. and F300 sensors, functions as fixed resistor.

There should be no open circuits, i.e., no infinite resistance readings. The LPO and RPO readings should be the same or very close (± 5 ohms).

5. Using the DMM, check between each pin and the sensor case.

   With the DMM set to its highest range, there should be infinite resistance on each lead. If there is any resistance at all, there is a short to case. See Table 10-7 for possible causes and solutions.

6. Test pin pairs as follows:
   a. Drive + against all other pins except Drive –
   b. Drive – against all other pins except Drive +
   c. Left pickoff + against all other pins except Left pickoff –
   d. Left pickoff – against all other pins except Left pickoff +
   e. Right pickoff + against all other pins except Right pickoff –
   f. Right pickoff – against all other pins except Right pickoff +
   g. RTD + against all other pins except LLC + and RTD/LLC
   h. LLC + against all other pins except RTD + and RTD/LLC
   i. RTD/LLC against all other pins except LLC + and RTD +

Note: D600 sensors and CMF400 sensors with booster amplifiers have different terminal pairs. Contact Micro Motion for assistance.

There should be infinite resistance for each pair. If there is any resistance at all, there is a short between pins. See Table 10-7 for possible causes and solutions.

7. If the problem is not resolved, contact Micro Motion.

Table 10-7 Sensor and cable short to case possible causes and remedies

Possible cause	Solution
Moisture inside the sensor junction box	Make sure that the junction box is dry and no corrosion is present.
Liquid or moisture inside the sensor case	Contact Micro Motion.
Internally shorted feedthrough (sealed passage for wiring from sensor to sensor junction box)	Contact Micro Motion.
Faulty cable	Replace cable.
Improper wire termination	Verify wire terminations inside sensor junction box. See Micro Motion's *9-Wire Cable Preparation and Installation Guide* or the sensor documentation.

To return to normal operation:

1. Align the three guide pins on the bottom of the core processor with the corresponding holes in the base of the core processor housing.
2. Carefully mount the core processor on the pins. **CAUTION! Do not twist or rotate the core processor when mounting it on the pins. Do not bend the sensor pins.**
3. Tighten the captive screw to 6 to 8 in-lbs (0,7 to 0,9 N-m) of torque.
4. Replace the core processor lid.
5. Restore power.

Note: When reassembling the meter components, be sure to grease all O-rings.

Appendix A
User-Defined Points

A.1 About this appendix

This appendix provides documentation for the five user-defined point types that are part of the Net Oil Computer Software.

A.2 NOC Station parameters (UDP 67)

Table A-1 NOC Station parameters (UDP 67)

#	Name	Access	Data type	Length	Range	Default value	Description
0	Point Tag ID	R/W	ASCII	10	0x20–0x7E for each ASCII character	"NOC Stn"	Name
1	Mass Units	R/W	UINT8	1	0–3	0	• 0 = lb • 1 = ton • 2 = kg • 3 = metric ton
2	Gas Volume Units	R/W	UINT8	1	0–3	0	• 0 = SCFT • 1 = Nm^3 • 2 = MSCFT • 3 = MNm^3
3	Liquid Volume Units	R/W	UINT8	1	0–3	0	• 0 = barrel • 1 = gallon • 2 = m^3 • 3 = liter
4	Density Units	R/W	UINT8	1	0–3	0	• 0 = g/cm^3 • 1 = kg/m^3 • 2 = spec gravity 60/60 • 3 = degrees API
5	Temperature Units	R/W	UINT8	1	0 –1	0	• 0 = °F • 1 = °C
6	Pressure Units	R/W	UINT8	1	0–3	0	• 0 = psi • 1 = kg/cm^2 • 2 = kPa • 3 = bar
7	Base Temperature Option	R/W	UINT8	1	0–2	0	• 0 = 60 °F • 1 = 15 °C • 2 = 20 °C
8	Time Base	R/W	UINT8	1	0–3	0	• 0 = Day • 1 = Hour • 2 = Minute • 3 = Second

Table A-1 NOC Station parameters (UDP 67) *continued*

#	Name	Access	Data type	Length	Range	Default value	Description
9	Operation Mode	R/W	UINT8	1	0–1	0	• 0 = Well test • 1 = Continuous
10	Test Status	R/W	UINT8	1	0–2	0	• 0 = Inactive • 1 = Paused • 2 = Purging • 3 = Running
11	Running mode	R/W	UINT8	1	0–3	0	• 0 = "" (blank) • 1 = Start • 2 = Pause • 3 = End test
12	Associated Gas Flow	R/W	TLP	3	Any valid TLP	0, 0, 0	The TLP that represents the gas station used for gas input data, typically STN 1, TAG (112, 0, 0)
13	Well Selected (Name)	R/W	ASCII	20	0x20–0x7E for each ASCII character	“Well 1”	Tag of the well currently/last tested
14	Well Selected (Index)	R/W	UINT8	1	0–49	0	Index of the well currently/last tested
15	Current Test Start Time	R/W	UNIT32	4	Time format long	‘2004-01-01’	Date and time of current/last well test start
16	Instant Liquid Mass Flow Rate	R/O	FLOAT	4	IEEE 754 float	0.0	Current liquid (oil/water mixture) flow rate, in mass units reported to time base
17	Instant Liquid Gross Volume Flow	R/O	FLOAT	4	IEEE 754 float	0.0	Current liquid (oil/water mixture) flow rate, uncorrected, in liquid volume units reported to time base
18	Instant Liquid Net Volume Flow	R/O	FLOAT	4	IEEE 754 float	0.0	Current liquid (oil/water mixture) flow rate, corrected, in liquid volume units reported to time base
19	Instant Water Cut Calculated	R/O	FLOAT	4	IEEE 754 float	0.0	Current water cut value, density-based, in % water
20	Instant Water Cut Measured	R/O	FLOAT	4	IEEE 754 float	0.0	Current water cut value, from water cut probe, in % water
21	Instant Water Cut Applied	R/O	FLOAT	4	IEEE 754 float	0.0	Current water cut value used for NOC calculations, in % water
22	Total Time	R/O	FLOAT	4	IEEE 754 float	0.0	Current test accumulated time, in minutes
23	Total Pause Time	R/O	FLOAT	4	IEEE 754 float	0.0	Current test accumulated pause time, in minutes
24	Total TBR Time	R/O	FLOAT	4	IEEE 754 float	0.0	Current test accumulated TBR time, in minutes
25	Total TMR Time	R/O	FLOAT	4	IEEE 754 float	0.0	Current test accumulated TMR time, in minutes
26	Total Gas	R/O	FLOAT	4	IEEE 754 float	0.0	Current test accumulated gas, in gas volume units
27	Total Gross Oil	R/O	FLOAT	4	IEEE 754 float	0.0	Current test accumulated oil, uncorrected, in liquid volume units

Table A-1 NOC Station parameters (UDP 67) *continued*

#	Name	Access	Data type	Length	Range	Default value	Description
28	Total Gross Water	R/O	FLOAT	4	IEEE 754 float	0.0	Current test accumulated total water, uncorrected, in liquid volume units
29	Total Gross Free Water	R/O	FLOAT	4	IEEE 754 float	0.0	Current test accumulated free water, uncorrected, in liquid volume units
30	Total Gross	R/O	FLOAT	4	IEEE 754 float	0.0	Current test accumulated liquid (oil/gas mixture), uncorrected, in liquid volume units
31	Total Net Oil	R/O	FLOAT	4	IEEE 754 float	0.0	Current test accumulated oil, corrected, in liquid volume units
32	Total Net Water	R/O	FLOAT	4	IEEE 754 float	0.0	Current test accumulated total water, corrected, in liquid volume units
33	Total Net Free Water	R/O	FLOAT	4	IEEE 754 float	0.0	Current test accumulated free water, corrected, in liquid volume units
34	Total Net	R/O	FLOAT	4	IEEE 754 float	0.0	Current test accumulated liquid (oil/water mixture), corrected, in liquid volume units
35	Average Gas	R/O	FLOAT	4	IEEE 754 float	0.0	Current test average gas flow rate, in gas volume units reported to time base
36	Average Gross Oil Vol	R/O	FLOAT	4	IEEE 754 float	0.0	Current test average oil flow rate, uncorrected, in liquid volume units reported to time base
37	Average Gross Water Vol	R/O	FLOAT	4	IEEE 754 float	0.0	Current test average total water flow rate, uncorrected, in liquid volume units reported to time base
38	Average Gross Free Water Vol	R/O	FLOAT	4	IEEE 754 float	0.0	Current test average free water flow rate, uncorrected, in liquid volume units reported to time base
39	Average Gross Liquid Vol	R/O	FLOAT	4	IEEE 754 float	0.0	Current test average liquid (oil/water mixture) flow rate, uncorrected, in liquid volume units reported to time base
40	Average Net Oil Vol	R/O	FLOAT	4	IEEE 754 float	0.0	Current test average oil flow rate, corrected, in liquid volume units reported to time base
41	Average Net Water Vol	R/O	FLOAT	4	IEEE 754 float	0.0	Current test average total water flow rate, corrected, in liquid volume units reported to time base
42	Average Net Free Water Vol	R/O	FLOAT	4	IEEE 754 float	0.0	Current test average free water flow rate, corrected, in liquid volume units reported to time base
43	Average Net Liquid Vol	R/O	FLOAT	4	IEEE 754 float	0.0	Current test average liquid (oil/water mixture) flow rate, corrected, in liquid volume units reported to time base
44	Average Water Cut	R/O	FLOAT	4	IEEE 754 float	0.0	Current test average water cut used in NOC calculations, in % water

Table A-1 **NOC Station parameters (UDP 67)** *continued*

#	Name	Access	Data type	Length	Range	Default value	Description
45	API Press Comp Oil Density	R/O	FLOAT	4	IEEE 754 float	0.0	Current test average oil density, pressure-corrected, in density units
46	Total Purge Time	R/O	FLOAT	4	IEEE 754 float	0.0	Current test total purge time, in minutes
47	Well Oil Density	R/O	FLOAT	4	IEEE 754 float	0.0	Oil density at reference temperature, as configured for the selected well
48	Well Water Density	R/O	FLOAT	4	IEEE 754 float	0.0	Water density at reference temperature, as configured for the selected well
49	Instant Gas Flow Rate	R/O	FLOAT	4	IEEE 754 float	0.0	Current gas flow rate, in gas volume units reported to time base
50	Instant Oil Density	R/O	FLOAT	4	IEEE 754 float	0.0	Parameter 47 value, corrected for temperature and pressure
51	Instant Water Density	R/O	FLOAT	4	IEEE 754 float	0.0	Parameter 48 value, corrected for temperature and pressure
52	Instant Emulsion Density	R/O	FLOAT	4	IEEE 754 float	0.0	Current density of liquid (oil/gas mixture), uncorrected
53	Instant Temperature	R/O	FLOAT	4	IEEE 754 float	0.0	Current temperature
54	Instant Reversed Mass Flow	R/O	FLOAT	4	IEEE 754 float	0.0	Current reverse flow rate, in mass units reported to time base
55	Instant Rev Liquid Gross Vol Flow	R/O	FLOAT	4	IEEE 754 float	0.0	Current reverse flow rate, uncorrected, in liquid volume units reported to time base
56	Total Mass	R/O	FLOAT	4	IEEE 754 float	0.0	Current test accumulated mass, forward flow only, in mass units
57	Total Reverse Mass	R/O	FLOAT	4	IEEE 754 float	0.0	Current test accumulated mass, reverse flow only, in mass units
58	Total Reverse Liquid Gross Vol	R/O	FLOAT	4	IEEE 754 float	0.0	Current test accumulated liquid (oil/water mixture), uncorrected, reverse flow only, in liquid volume units
59	Total Reverse Flow Time	R/O	FLOAT	4	IEEE 754 float	0.0	Current test accumulated minutes in reverse flow
60	Average Density	R/O	FLOAT	4	IEEE 754 float	0.0	Current test average density, in density units of the liquid (oil/water mixture)
61	Average Temperature	R/O	FLOAT	4	IEEE 754 float	0.0	Current test average temperature, in temperature units
62	Average Mass Flow	R/O	FLOAT	4	IEEE 754 float	0.0	Current test average flow rate, forward only, of the liquid (oil/water mixture), in mass units reported to time base

A.3 NOC Meter parameters (UDP 68)

Table A-2 NOC Meter parameters (UDP 68)

#	Name	Access	Data type	Length	Range	Default value	Description
0	Point Tag ID	R/W	ASCII	10	0x20–0x7E for each ASCII character	“NOC Meter ”	Name
1	NOC Station Number	R/W	UINT8	1	0	0	The NOC Station this NOC Meter is assigned to. Always 0.
2	Modbus Device Number	R/O	UINT8	1	0–255	0	MMI Interface # (1–3) providing input to this NOC Meter. If inputs are manual, defaults to 0.
3	COM Port (tag)	R/O	ASCII	10	0x20–0x7E for each ASCII character	“Undefined”	Comm port on ROC809 platform used for communication with device specified by Parameter 2.
4	TBR Option	R/W	UINT8	1	0–1	0	• 0 = Off • 1 = On
5	TBR Drive Gain Setpoint	R/W	FLOAT	4	IEEE 754 float	0.0	Drive gain setpoint above which TBR is assumed to occur
6	TBR Time Seconds	R/W	FLOAT	4	IEEE 754 float	0.0	TBR time, in seconds
7	TBR Action Option	R/W	UINT8	1	0–4	0	• 0 = None • 1 = Correct density • 2 = Log alarm • 3 = Energize DO • 4 = All
8	TBR Mode Total Time	R/O	FLOAT	4	IEEE 754 float	0.0	TBR mode accumulated time, in minutes
9	TBR Total Water	R/O	FLOAT	4	IEEE 754 float	0.0	TBR mode accumulated total water, in liquid volume units
10	TBR Total Oil	R/O	FLOAT	4	IEEE 754 float	0.0	TBR mode accumulated oil, in liquid volume units
11	TBR Average Water Cut	R/O	FLOAT	4	IEEE 754 float	0.0	TBR mode average water cut, in % water
12	TBR DO TLP	R/W	TLP	3	DO TLP	0,0,0	DO to be energized when TBR occurs
13	Coriolis Drive Gain TLP	R/W	TLP	3	TLP	0,0,0	Source of drive gain data
14	Coriolis Mass Value TLP	R/W	TLP	3	TLP	0,0,0	Source of mass total data
15	Density TLP	R/W	TLP	3	TLP	0,0,0	Source of density data
16	Static Pressure TLP	R/W	TLP	3	Any TLP	0,0,0	Source of pressure data
17	Temperature TLP	R/W	TLP	3	Any TLP	0,0,0	Source of temperature data

Table A-2 **NOC Meter parameters (UDP 68)** *continued*

#	Name	Access	Data type	Length	Range	Default value	Description
18	Low Water Monitor TLP	R/W	TLP	3	Any TLP	0,0,0	Analog input from low-end water cut probe
19	High Water Monitor TLP	R/W	TLP	3	Any TLP	0,0,0	Analog input from high-end water cut probe
20	Coriolis Drive Gain Value	R/W	FLOAT	4	IEEE 754 float	0.0	Current drive gain value, in volts
21	Coriolis Mass Value	R/W	FLOAT	4	IEEE 754 float	0.0	Current accumulated mass value, in mass units
22	Density Value	R/W	FLOAT	4	IEEE 754 float	0.0	Current density value, in density units
23	Static Pressure Value	R/W	FLOAT	4	IEEE 754 float	0.0	Current pressure value, in pressure units
24	Temperature Value	R/W	FLOAT	4	IEEE 754 float	0.0	Current temperature value, in temperature units
25	Low Water Monitor Value	R/W	FLOAT	4	IEEE 754 float	0.0	Current water cut value from low-end water cut probe, in % water
26	High Water Monitor Value	R/W	FLOAT	4	IEEE 754 float	0.0	Current water cut value from high-end water cut probe, in % water
27	Low Mass Flow Cutoff	R/W	FLOAT	4	IEEE 754 float	0.0	Low mass flow cutoff, in mass units reported to time base
28	Low Water Monitor Limit	R/W	FLOAT	4	IEEE 754 float	0.0	Water cut probe limit, low end, in % water
29	High Water Monitor Limit	R/W	FLOAT	4	IEEE 754 float	0.0	Water cut probe limit, high end, in % water
30	Water Monitors Limit Tolerance	R/W	FLOAT	4	IEEE 754 float	0.0	Water cut difference limit, in % water
31	Water Monitor Mode	R/W	UINT8	1	0–1	0	• 0 = Auto • 1 = Ignore
32	Auto Configure Command	R/W	UINT8	1	0–1	0	• 0 = Don't configure • 1 = Configure
33	Instant Mass Flow	R/O	FLOAT	4	IEEE 754 float	0.0	Current flow rate, in mass units reported to time base
34	Instant Gross Oil Vol Flow	R/O	FLOAT	4	IEEE 754 float	0.0	Current oil flow rate, uncorrected, in liquid volume units reported to time base
35	Instant Gross Water Vol Flow	R/O	FLOAT	4	IEEE 754 float	0.0	Current total water flow rate, uncorrected, in liquid volume units reported to time base
36	Instant Gross Free Water Vol Flow	R/O	FLOAT	4	IEEE 754 float	0.0	Current free water flow rate, uncorrected, in liquid volume units reported to time base

Table A-2 **NOC Meter parameters (UDP 68)** *continued*

#	Name	Access	Data type	Length	Range	Default value	Description
37	Instant Gross Liquid Vol Flow	R/O	FLOAT	4	IEEE 754 float	0.0	Current liquid (oil/gas mixture) flow rate, uncorrected, in liquid volume units reported to time base
38	Instant Net Oil Vol Flow	R/O	FLOAT	4	IEEE 754 float	0.0	Current oil flow rate, corrected, in liquid volume units reported to time base
39	Instant Net Water Vol Flow	R/O	FLOAT	4	IEEE 754 float	0.0	Current total water flow rate, corrected, in liquid volume units reported to time base
40	Instant Net Free Water Vol Flow	R/O	FLOAT	4	IEEE 754 float	0.0	Current free water flow rate, corrected, in liquid volume units reported to time base
41	Instant Net Liquid Vol Flow	R/O	FLOAT	4	IEEE 754 float	0.0	Current liquid (oil/gas mixture) flow rate, corrected, in liquid volume units reported to time base
42	Instant Water Cut Calculated	R/O	FLOAT	4	IEEE 754 float	0.0	Current water cut value, density-based, in % water
43	Instant Water Cut Measured	R/O	FLOAT	4	IEEE 754 float	0.0	Current water cut value, from water cut probe, in % water
44	Instant Water Cut Applied	R/O	FLOAT	4	IEEE 754 float	0.0	Water cut value currently used in NOC calculations, in % water
45	Total Time	R/O	FLOAT	4	IEEE 754 float	0.0	Accumulated test time, in minutes
46	Total Gross Oil	R/O	FLOAT	4	IEEE 754 float	0.0	Current test accumulated oil, uncorrected, in liquid volume units
47	Total Gross Water	R/O	FLOAT	4	IEEE 754 float	0.0	Current test accumulated total water, uncorrected, in liquid volume units
48	Total Gross Free Water	R/O	FLOAT	4	IEEE 754 float	0.0	Current test accumulated free water, uncorrected, in liquid volume units
49	Total Gross Liquid	R/O	FLOAT	4	IEEE 754 float	0.0	Current test accumulated liquid (oil/water mixture), uncorrected, in liquid volume units
50	Total Net Oil	R/O	FLOAT	4	IEEE 754 float	0.0	Current test accumulated oil, corrected, in liquid volume units
51	Total Net Water	R/O	FLOAT	4	IEEE 754 float	0.0	Current test accumulated total water, corrected, in liquid volume units
52	Total Net Free Water	R/O	FLOAT	4	IEEE 754 float	0.0	Current test accumulated free water, corrected, in liquid volume units
53	Total Net Liquid	R/O	FLOAT	4	IEEE 754 float	0.0	Current test accumulated liquid (oil/water mixture), corrected, in liquid volume units
54	Average Gross Oil Vol Flow	R/O	FLOAT	4	IEEE 754 float	0.0	Current test average oil flow rate, uncorrected, in liquid volume units reported to time base

Table A-2 **NOC Meter parameters (UDP 68)** *continued*

#	Name	Access	Data type	Length	Range	Default value	Description
55	Average Gross Water Vol Flow	R/O	FLOAT	4	IEEE 754 float	0.0	Current test average total water flow rate, uncorrected, in liquid volume units reported to time base
56	Average Gross Free Water Vol Flow	R/O	FLOAT	4	IEEE 754 float	0.0	Current test average free water flow rate, uncorrected, in liquid volume units reported to time base
57	Average Gross Liquid Vol Flow	R/O	FLOAT	4	IEEE 754 float	0.0	Current test average liquid (oil/water mixture) flow rate, uncorrected, in liquid volume units reported to time base
58	Average Net Oil Vol Flow	R/O	FLOAT	4	IEEE 754 float	0.0	Current test average oil flow rate, corrected, in liquid volume units reported to time base
59	Average Net Water Vol Flow	R/O	FLOAT	4	IEEE 754 float	0.0	Current test average total water flow rate, corrected, in liquid volume units reported to time base
60	Average Net Free Water Vol Flow	R/O	FLOAT	4	IEEE 754 float	0.0	Current test average free water flow rate, corrected, in liquid volume units reported to time base
61	Average Net Liquid Vol Flow	R/O	FLOAT	4	IEEE 754 float	0.0	Current test average liquid (oil/water mixture) flow rate, corrected, in liquid volume units reported to time base
62	Average Water Cut Applied	R/O	FLOAT	4	IEEE 754 float	0.0	Current test average water cut used in NOC calculations, in % water
63	Flow Rate Alarm Option	R/W	UINT8	1	0–1	0	• 0 = Disabled • 1 = Enabled
64	SRBX on Set	R/W	UINT8	1	0–1	0	• 0 = Disabled • 1 = Enabled
65	SRBX on Clear	R/W	UINT8	1	0–1	0	• 0 = Disabled • 1 = Enabled
66	Low Flow Rate Alarm Value	R/W	FLOAT	4	IEEE 754 float	1,000.0	Setpoint for low flow rate alarm, in liquid volume units reported to time base
67	High Flow Rate Alarm Value	R/W	FLOAT	4	IEEE 754 float	10,000.0	Setpoint for high flow rate alarm, in liquid volume units reported to time base
68	Flow Rate Alarm Deadband	R/W	FLOAT	4	IEEE 754 float	100.0	Inactive range above high flow rate alarm setpoint or below low flow rate alarm setpoint
69	Coriolis Alarm Dword	R/O	UINT32	4	UINT32	0	Alarm status bits from Micro Motion sensor, registers 245 and 246
70	Coriolis No Comm Alarm	R/O	UINT8	1	0–1	0	• 0 = Communicating • 1 = Not communicating

Table A-2 **NOC Meter parameters (UDP 68)** *continued*

#	Name	Access	Data type	Length	Range	Default value	Description
71	Alarm Code	R/O	BIN	1	0x00 0xFF	0x00	Bits represent the following: • Bit 0 = Low flow • Bit 2 = High flow • Bit 4 = No communication • Bit 5 = Any from parameter 69 • Bit 6 = No flow For each bit, status is indicated as: • 0 = Inactive • 1 = Active
72	Minimum WC for Pure Water	R/W	FLOAT	4	IEEE 754 float	0.0	Free water setpoint, in % water
73	Manual Water Cut	R/W	FLOAT	4	IEEE 754 float	0.0	Water cut entered manually during density determination routine for oil
74	Density Measure-ment Mode	R/W	UINT8	1	0–6	0.0	Density determination routine command: • 0 = Inactive • 1 = Start water • 2 = Start oil • 3 = Apply water cut • 4 = Save water density • 5 = Save oil density • 6 = Reset • 7 = End
75	API Press Comp Oil Density	R/O	FLOAT	4	IEEE 754 float	0.0	Current average oil density, pressure-corrected, in density units
76	Instant Reverse Mass Flow	R/O	FLOAT	4	IEEE 754 float	0.0	Current reverse flow rate, in mass units reported to time base
77	Instant Reverse Gross Liq Flow	R/O	FLOAT	4	IEEE 754 float	0.0	Current reverse flow rate, uncorrected, in liquid volume units reported to time base
78	Total Reverse Time	R/O	FLOAT	4	IEEE 754 float	0.0	Current test accumulated minutes in reverse flow
79	Total Mass	R/O	FLOAT	4	IEEE 754 float	0.0	Current test accumulated mass, forward flow only, in mass units
80	Total Reverse Mass	R/O	FLOAT	4	IEEE 754 float	0.0	Current test accumulated mass, reverse flow only, in mass units
81	Total Reverse Gross Liquid	R/O	FLOAT	4	IEEE 754 float	0.0	Current test accumulated liquid (oil/water mixture), uncorrected, reverse flow only, in liquid volume units
82	Average Mass Flow	R/O	FLOAT	4	IEEE 754 float	0.0	Current test average flow rate of the liquid (oil/water mixture), forward flow only, in mass units reported to time base
83	Average Reverse Mass Flow	R/O	FLOAT	4	IEEE 754 float	0.0	Current test average flow rate of the liquid (oil/water mixture), reverse flow only, in mass units reported to time base

Table A-2 NOC Meter parameters (UDP 68) *continued*

#	Name	Access	Data type	Length	Range	Default value	Description
84	Average Reverse Gross Lq Flow	R/O	FLOAT	4	IEEE 754 float	0.0	Current test average flow rate, uncorrected, reverse flow only, in liquid volume units reported to time base
85	Average Density	R/O	FLOAT	4	IEEE 754 float	0.0	Average density of the liquid (oil/water mixture), in density units
86	Average Temperature	R/O	FLOAT	4	IEEE 754 float	0.0	Average temperature, in temperature units
87	Net Oil Density DDR	R/O	FLOAT	4	IEEE 754 float	0.0	Oil density at reference temperature, corrected, as determined by the density determination routine
88	Net Water Density DDR	R/O	FLOAT	4	IEEE 754 float	0.0	Water density at reference temperature, corrected, as determined by the density determination routine
89	DDR Test Time	R/W	FLOAT	4	IEEE 754 float	0.0	Time specified for density determination sample period, in minutes and decimal fractions
90	DDR Test Time Remaining	R/O	FLOAT	4	IEEE 754 float	0.0	Time remaining in density determination sample period, in minutes and decimal fractions
91	DDR Water Cut Temperature	R/W	FLOAT	4	IEEE 754 float	0.0	Externally determined temperature of water fraction, in temperature units
92	DDR Previous Mode	R/O	UINT8	1			Most recent DDR command: • 0 = Inactive • 1 = Start water • 2 = Start oil • 3 = Apply water cut • 4 = Save water density • 5 = Save oil density • 6 = Reset • 7 = End
93	Water Monitor Select	R/O	UINT8	1			Current water cut source: • 0 = Density-based water cut • 1 = Water cut data

A.4 Well Data parameters (UDP 69)

Table A-3 Well Data parameters (UDP 69)

#	Name	Access	Data type	Length	Range	Default value	Description
0	Point/Well Tag ID	R/W	ASCII	20	0x20–0x7E for each ASCII character	“Well #01”	Name
1	Oil Density	R/W	FLOAT	4	IEEE 754 float	0	Oil density at reference temperature, in density units
2	Water Density	R/W	FLOAT	4	IEEE 754 float	0.0	Water density at reference temperature, in density units

Table A-3 **Well Data parameters (UDP 69)** *continued*

#	Name	Access	Data type	Length	Range	Default value	Description
3	Oil Press Corr Factor	R/W	FLOAT	4	IEEE 754 float	0.0	Not used
4	Oil Temperature Shrinkage Fact	R/W	FLOAT	4	IEEE 754 float	0.0	Not used
5	Water Temp Shrinkage Factor	R/W	FLOAT	4	IEEE 754 float	0.0	Not used
6	Purge Time	R/W	FLOAT	4	IEEE 754 float	0.0	Purge time, in minutes
7	History Record to Retrieve	R/W	UINT8	1	0–5	0	Well test mode: History record to retrieve: • 0 = Most recent • 1 = 2nd most recent • 2 = 3rd most recent • 3 = 4th most recent • 4 = 5th most recent • 5 = 6th most recent Continuous mode: Station record to retrieve: • 0 = NOC Station • 1 = 1st Meter • 2 = 2nd meter • 3 = 3rd meter
8	Test Start Time	R/O	UINT32	4	Time format long	1/1/1970	Selected record: Test start date and time
9	Test End Time	R/O	UINT32	4	Time format long	1/1/1970	Selected record: Test end date and time
10	Last Recalcu-lation Time	R/O	UINT32	4	Time format long	1/1/1970	Selected record: Last recalculation date and time
11	Test Duration	R/O	FLOAT	4	IEEE 754 float	0.0	Selected record: Test duration, in minutes
12	Test Purge Time	R/O	FLOAT	4	IEEE 754 float	0.0	Selected record: Purge time, in minutes
13	TBR Time	R/O	FLOAT	4	IEEE 754 float	0.0	Selected record: TBR time, in minutes
14	TMR Time	R/O	FLOAT	4	IEEE 754 float	0.0	Selected record: TMR time, in minutes
15	Pause Time	R/O	FLOAT	4	IEEE 754 float	0.0	Selected record: Test pause time, in minutes
16	Base Temperature Ini	R/O	UINT8	1	0–2	0	Selected record: Reference temperature: • 0 = 60 °F • 1 = 15 °C • 2 = 20 °C
17	Water Cut Ini	R/O	FLOAT	4	IEEE 754 float	0.0	Selected record: Water cut value, original, in % water
18	Gas Total Ini	R/O	FLOAT	4	IEEE 754 float	0.0	Selected record: Accumulated gas, original value, in gas volume units

Table A-3 Well Data parameters (UDP 69) *continued*

#	Name	Access	Data type	Length	Range	Default value	Description
19	Gas Oil Ratio Ini	R/O	FLOAT	4	IEEE 754 float	0.0	Selected record: Gas To Oil Ratio, original value, gas volume units divided by liquid volume units
20	Average Gas Ini	R/O	FLOAT	4	IEEE 754 float	0.0	Selected record: Average gas flow rate, original value, in gas volume units reported to time base
21	Total Gross Oil Ini	R/O	FLOAT	4	IEEE 754 float	0.0	Selected record: Accumulated oil, uncorrected, original value, in liquid volume units
22	Total Gross Water Ini	R/O	FLOAT	4	IEEE 754 float	0.0	Selected record: Accumulated total water, uncorrected, original value, in liquid volume units
23	Total Gross Free Water Ini	R/O	FLOAT	4	IEEE 754 float	0.0	Selected record: Accumulated free water, uncorrected, original value, in liquid volume units
24	Total Net Oil Ini	R/O	FLOAT	4	IEEE 754 float	0.0	Selected record: Accumulated oil, corrected, original value, in liquid volume units
25	Total Net Water Ini	R/O	FLOAT	4	IEEE 754 float	0.0	Selected record: Accumulated total water, corrected, original value, in liquid volume units
26	Total Net Free Water Ini	R/O	FLOAT	4	IEEE 754 float	0.0	Selected record: Accumulated free water, corrected, original value, in liquid volume units
27	Average Gross Oil Ini	R/O	FLOAT	4	IEEE 754 float	0.0	Selected record: Average oil flow rate, uncorrected, original value, in liquid volume units reported to time base
28	Average Gross Water Ini	R/O	FLOAT	4	IEEE 754 float	0.0	Selected record: Average total water flow rate, uncorrected, original value, in liquid volume units reported to time base
29	Average Gross Free Water Ini	R/O	FLOAT	4	IEEE 754 float	0.0	Selected record: Average free water flow rate, uncorrected, original value, in liquid volume units reported to time base
30	Average Net Oil Ini	R/O	FLOAT	4	IEEE 754 float	0.0	Selected record: Average oil flow rate, corrected, original value, in liquid volume units reported to time base
31	Average Net Water Ini	R/O	FLOAT	4	IEEE 754 float	0.0	Selected record: Average total water flow rate, corrected, original value, in liquid volume units reported to time base
32	Average Net Free Water Ini	R/O	FLOAT	4	IEEE 754 float	0.0	Selected record: Average free water flow rate, corrected, original value, in liquid volume units reported to time base
33	Base Temperature Rec	R/O	FLOAT	1	0–2	0	Selected record: Reference temperature used for recalculation: • 0 = 60 °F • 1 = 15 °C • 2 = 20 °C

Table A-3 **Well Data parameters (UDP 69)** *continued*

#	Name	Access	Data type	Length	Range	Default value	Description
34	Water Cut Rec	R/O	FLOAT	4	IEEE 754 float	0.0	Selected record: Water cut value, recalculated, in % water
35	Gas Total Rec	R/O	FLOAT	4	IEEE 754 float	0.0	Selected record: Accumulated gas, recalculated value, in gas volume units
36	Gas Oil Ratio Rec	R/O	FLOAT	4	IEEE 754 float	0.0	Selected record: Gas To Oil Ratio, recalculated value, gas volume units divided by liquid volume units
37	Average Gas Rec	R/O	FLOAT	4	IEEE 754 float	0.0	Selected record: Average gas flow rate, recalculated value, in gas volume units reported to time base
38	Total Gross Oil Rec	R/O	FLOAT	4	IEEE 754 float	0.0	Selected record: Accumulated oil, uncorrected, recalculated value, in liquid volume units
39	Total Gross Water Rec	R/O	FLOAT	4	IEEE 754 float	0.0	Selected record: Accumulated total water, uncorrected, recalculated value, in liquid volume units
40	Total Gross Free Water Rec	R/O	FLOAT	4	IEEE 754 float	0.0	Selected record: Accumulated free water, uncorrected, recalculated value, in liquid volume units
41	Total Net Oil Rec	R/O	FLOAT	4	IEEE 754 float	0.0	Selected record: Accumulated oil, corrected, recalculated value, in liquid volume units
42	Total Net Water Rec	R/O	FLOAT	4	IEEE 754 float	0.0	Selected record: Accumulated total water, corrected, recalculated value, in liquid volume units
43	Total Net Free Water Rec	R/O	FLOAT	4	IEEE 754 float	0.0	Selected record: Accumulated free water, corrected, recalculated value, in liquid volume units
44	Average Gross Oil Rec	R/O	FLOAT	4	IEEE 754 float	0.0	Selected record: Average oil flow rate, uncorrected, recalculated value, in liquid volume units reported to time base
45	Average Gross Water Rec	R/O	FLOAT	4	IEEE 754 float	0.0	Selected record: Average total water flow rate, uncorrected, recalculated value, in liquid volume units reported to time base
46	Average Gross Free Water Rec	R/O	FLOAT	4	IEEE 754 float	0.0	Selected record: Average free water flow rate, uncorrected, recalculated value, in liquid volume units reported to time base
47	Average Net Oil Rec	R/O	FLOAT	4	IEEE 754 float	0.0	Selected record: Average oil flow rate, corrected, recalculated value, in liquid volume units reported to time base
48	Average Net Water Rec	R/O	FLOAT	4	IEEE 754 float	0.0	Selected record: Average total water flow rate, corrected, recalculated value, in liquid volume units reported to time base

Table A-3 Well Data parameters (UDP 69) *continued*

#	Name	Access	Data type	Length	Range	Default value	Description
49	Average Net Free Water Rec	R/O	FLOAT	4	IEEE 754 float	0.0	Selected record: Average free water flow rate, corrected, recalculated value, in liquid volume units reported to time base
50	Total Mass Ini	R/O	FLOAT	4	IEEE 754 float	0.0	Selected record: Accumulated mass, forward flow only, original value, in mass units
51	Total Reverse Mass Ini	R/O	FLOAT	4	IEEE 754 float	0.0	Selected record: Accumulated mass, reverse flow only, original value, in mass units
52	Total Mass Rec	R/O	FLOAT	4	IEEE 754 float	0.0	Selected record: Accumulated mass, forward flow only, recalculated value, in mass units
53	Total Reverse Mass Rec	R/O	FLOAT	4	IEEE 754 float	0.0	Selected record: Accumulated mass, reverse flow only, recalculated value, in mass units
54	Average Density Ini	R/O	FLOAT	4	IEEE 754 float	0.0	Selected record: Average density of liquid (oil/water mixture), forward flow only, original value, in density units
55	Average Temperature Ini	R/O	FLOAT	4	IEEE 754 float	0.0	Selected record: Average temperature, original value, in temperature units
56	Average Density Rec	R/O	FLOAT	4	IEEE 754 float	0.0	Selected record: Average density of liquid (oil/water mixture), forward flow only, recalculated value, in density units
57	Average Temperature Rec	R/O	FLOAT	4	IEEE 754 float	0.0	Selected record: Average temperature, recalculated value, in temperature units

A.5 NOC Recalculation parameters (UDP 70)

Table A-4 NOC Recalculation parameters (UDP 70

#	Name	Access	Data type	Length	Range	Default value	Description
0	Point Tag ID	R/W	ASCII	10	0x20–0x7E for each ASCII character	“NOC Stn”	Name
1	Mass Units	R/W	UINT8	1	0–3	0	Unit to be used for recalculation: • 0 = lb • 1 = ton • 2 = kg • 3 = metric ton
2	Gas Volume Units	R/W	UINT8	1	0–1	0	Unit to be used for recalculation: • 0 = SCFT • 1 = Nm^3 • 2 = MSCFT • 3 = MNm^3

Table A-4 **NOC Recalculation parameters (UDP 70** *continued*

#	Name	Access	Data type	Length	Range	Default value	Description
3	Liquid Volume Units	R/W	UINT8	1	0–3	0	Unit to be used for recalculation: • 0 = barrel • 1 = gallon • 2 = m^3 • 3 = liter
4	Density Units	R/W	UINT8	1	0–3	0	Unit to be used for recalculation: • 0 = g/cm^3 • 1 = kg/m^3 • 2 = spec gravity 60/60 • 3 = degrees API
5	Temperature Units	R/W	UINT8	1	0–1	0	Unit to be used for recalculation: • 0 = °F • 1 = °C
6	Pressure Units	R/W	UINT8	1	0–3	0	Unit to be used for recalculation: • 0 = psi • 1 = kg/cm^2 • 2 = kPa • 3 = bar
7	Base Temperature Option	R/W	UINT8	1	0–2	0	Reference temperature to be used for recalculation: • 0 = 60 °F • 1 = 15 °C • 2 = 20 °C
8	Time Base	R/W	UINT8	1	0–3	0	Time base to be used for recalculation: • 0 = Day • 1 = Hour • 2 = Minute • 3 = Second
9	Operation Mode	R/O	UINT8	1	0–1	0	• 0 = Well test • 1 = Continuous
10	Test Status	R/O	UINT8	1	0–2	0	• 0 = Inactive • 1 = Paused • 2 = Purging • 3 = Running
11	Well Selected (Name)	R/W	ASCII	20	0x20–0x7E for each ASCII character	“Well 1”	Identifier of the well currently/last tested
12	Well Selected (Index)	R/W	UINT8	1	0–49	0	Index of the well currently/last tested
13	Current Test Start Time	R/W	UINT32	4	Time format long	‘2004-01-01’	Date and time of current/last well test start
14	Recalcu-lation Mode	R/W	UINT8	1	0–1	0	• 0 = Don’t recalculate • 1 = Recalculate
15	Current Record	R/O	UINT16	2	0–1440	0	Index of the record currently recalculated
16	Recalcu-lation Save	R/W	UINT8	1	0–1	0	• 0 = Don’t save • 1 = Save
17	Recalcu-lation Status	R/O	UINT8	1	0–11	0	Not used

Table A-4 NOC Recalculation parameters (UDP 70 *continued*)

#	Name	Access	Data type	Length	Range	Default value	Description
18	Total Time	R/O	FLOAT	4	IEEE 754 float	0.0	Current test accumulated time, in minutes
19	Total TBR Time	R/O	FLOAT	4	IEEE 754 float	0.0	Current test accumulated TBR time, in minutes
20	Total Pause Time	R/O	FLOAT	4	IEEE 754 float	0.0	Current test accumulated pause time, in minutes
21	Total Gas	R/O	FLOAT	4	IEEE 754 float	0.0	Accumulated gas, in gas volume units, pre/post recalculation
22	Total Gross Oil	R/O	FLOAT	4	IEEE 754 float	0.0	Accumulated oil, uncorrected, in liquid volume units, pre/post recalculation
23	Total Gross Water	R/O	FLOAT	4	IEEE 754 float	0.0	Accumulated total water, uncorrected, in liquid volume units, pre/post recalculation
24	Total Gross Free Water	R/O	FLOAT	4	IEEE 754 float	0.0	Accumulated free water, uncorrected, in liquid volume units, pre/post recalculation
25	Total Gross Liquid	R/O	FLOAT	4	IEEE 754 float	0.0	Accumulated liquid (oil/water mixture), uncorrected, in liquid volume units, pre/post recalculation
26	Total Net Oil	R/O	FLOAT	4	IEEE 754 float	0.0	Accumulated oil, corrected, in liquid volume units, pre/post recalculation
27	Total Net Water	R/O	FLOAT	4	IEEE 754 float	0.0	Accumulated total water, corrected, in liquid volume units, pre/post recalculation
28	Total Net Free Water	R/O	FLOAT	4	IEEE 754 float	0.0	Accumulated free water, corrected, in liquid volume units, pre/post recalculation
29	Total Net Liquid	R/O	FLOAT	4	IEEE 754 float	0.0	Accumulated liquid (oil/water mixture), corrected, in liquid volume units, pre/post recalculation
30	Average Gas Vol Flow	R/O	FLOAT	4	IEEE 754 float	0.0	Average gas flow rate, in gas volume units reported to time base, pre/post recalculation
31	Average Water Cut Applied	R/O	FLOAT	4	IEEE 754 float	0.0	Average water cut used for NOC calculations, in % water by volume, pre/post recalculation
32	Average Gross Oil Vol Flow	R/O	FLOAT	4	IEEE 754 float	0.0	Average oil flow rate, uncorrected, in liquid volume units reported to time base, pre/post recalculation
33	Average Gross Water Vol Flow	R/O	FLOAT	4	IEEE 754 float	0.0	Average total water flow rate, uncorrected, in liquid volume units reported to time base, pre/post recalculation
34	Average Gross Free Water Vol Flow	R/O	FLOAT	4	IEEE 754 float	0.0	Average free water flow rate, uncorrected, in liquid volume units reported to time base, pre/post recalculation

Table A-4 **NOC Recalculation parameters (UDP 70** *continued*

#	Name	Access	Data type	Length	Range	Default value	Description
35	Average Gross Liquid Vol Flow	R/O	FLOAT	4	IEEE 754 float	0.0	Average liquid (oil/water mixture) flow rate, uncorrected, in liquid volume units reported to time base, pre/post recalculation
36	Average Net Oil Vol Flow	R/O	FLOAT	4	IEEE 754 float	0.0	Average oil flow rate, corrected, in liquid volume units reported to time base, pre/post recalculation
37	Average Net Water Vol Flow	R/O	FLOAT	4	IEEE 754 float	0.0	Average total water flow rate, corrected, in liquid volume units reported to time base, pre/post recalculation
38	Average Net Free Water Vol Flow	R/O	FLOAT	4	IEEE 754 float	0.0	Average free water flow rate, corrected, in liquid volume units reported to time base, pre/post recalculation
39	Average Net Liquid Vol Flow	R/O	FLOAT	4	IEEE 754 float	0.0	Average liquid (oil/water mixture) flow rate, corrected, in liquid volume units reported to time base, pre/post recalculation
40	API Press Comp Oil Density	R/O	FLOAT	4	IEEE 754 float	0.0	Average oil density, pressure-corrected, in density units
41	Recalculable Test Index	R/O	UINT8	1	0–9	0.0	Index of test selected for recalculation
42	Data Base Oil Density	R/O	FLOAT	4	IEEE 754 float	0.0	Oil density at reference temperature for selected well, configured value, in density units
43	Data Base Water Density	R/O	FLOAT	4	IEEE 754 float	0.0	Oil density at reference temperature for selected well, configured value, in density units
44	Recalcu-lation Oil Density	R/W	FLOAT	4	IEEE 754 float	0.0	Oil density at reference temperature for selected well, value to be used for recalculation, in density units
45	Recalcu-lation Water Density	R/W	FLOAT	4	IEEE 754 float	0.0	Oil density at reference temperature for selected well, value to be used for recalculation, in density units
46	Rec 1 Well Tag	R/W	ASCII	20	0x20–0x7E for each ASCII character	“”	Well tag for Recalculable Test 1
47	Rec 1 Start Time	R/W	UINT32	4	Date And Time	0.0	Start time for Recalculable Test 1
48	Rec 1 End Time	R/W	UINT32	4	Date And Time	0.0	End time for Recalculable Test 1
49	Rec 2 Well Tag	R/W	ASCII	20	0x20–0x7E for each ASCII character	“”	Well tag for Recalculable Test 2
50	Rec 2 Start Time	R/W	UINT32	4	Date And Time	0.0	Start time for Recalculable Test 2

Table A-4 NOC Recalculation parameters (UDP 70 *continued*

#	Name	Access	Data type	Length	Range	Default value	Description
51	Rec 2 End Time	R/W	UINT32	4	Date And Time	0.0	End time for Recalculable Test 2
52	Rec 3 Well Tag	R/W	ASCII	20	0x20–0x7E for each ASCII character	“”	Well tag for Recalculable Test 3
53	Rec 3 Start Time	R/W	UINT32	4	Date And Time	0.0	Start time for Recalculable Test 3
54	Rec 3 End Time	R/W	UINT32	4	Date And Time	0.0	End time for Recalculable Test 3
55	Rec 4 Well Tag	R/W	ASCII	20	0x20–0x7E for each ASCII character	“”	Well tag for Recalculable Test 4
56	Rec 4 Start Time	R/W	UINT32	4	Date And Time	0.0	Start time for Recalculable Test 4
57	Rec 4 End Time	R/W	UINT32	4	Date And Time	0.0	End time for Recalculable Test 4
58	Rec 5 Well Tag	R/W	ASCII	20	0x20–0x7E for each ASCII character	“”	Well tag for Recalculable Test 5
59	Rec 5 Start Time	R/W	UINT32	4	Date And Time	0.0	Start time for Recalculable Test 5
60	Rec 5 End Time	R/W	UINT32	4	Date And Time	0.0	End time for Recalculable Test 5
61	Rec 6 Well Tag	R/W	ASCII	20	0x20–0x7E for each ASCII character	“”	Well tag for Recalculable Test 6
62	Rec 6 Start Time	R/W	UINT32	4	Date And Time	0.0	Start time for Recalculable Test 6
63	Rec 6 End Time	R/W	UINT32	4	Date And Time	0.0	End time for Recalculable Test 6
64	Rec 7 Well Tag	R/W	ASCII	20	0x20–0x7E for each ASCII character	“”	Well tag for Recalculable Test 7
65	Rec 7 Start Time	R/W	UINT32	4	Date And Time	0.0	Start time for Recalculable Test 7
66	Rec 7 End Time	R/W	UINT32	4	Date And Time	0.0	End time for Recalculable Test 7
67	Rec 8 Well Tag	R/W	ASCII	20	0x20–0x7E for each ASCII character	“”	Well tag for Recalculable Test 8
68	Rec 8 Start Time	R/W	UINT32	4	Date And Time	0.0	Start time for Recalculable Test 8
69	Rec 8 End Time	R/W	UINT32	4	Date And Time	0.0	End time for Recalculable Test 8

Table A-4 **NOC Recalculation parameters (UDP 70** *continued*

#	Name	Access	Data type	Length	Range	Default value	Description
70	Rec 9 Well Tag	R/W	ASCII	20	0x20–0x7E for each ASCII character	“”	Well tag for Recalculable Test 9
71	Rec 9 Start Time	R/W	UINT32	4	Date And Time	0.0	Start time for Recalculable Test 9
72	Rec 9 End Time	R/W	UINT32	4	Date And Time	0.0	End time for Recalculable Test 9
73	Rec 10 Well Tag	R/W	ASCII	20	0x20–0x7E for each ASCII character	“”	Well tag for Recalculable Test 10
74	Rec 10 Start Time	R/W	UINT32	4	Date And Time	0.0	Start time for Recalculable Test 10
75	Rec 10 End Time	R/W	UINT32	4	Date And Time	0.0	End time for Recalculable Test 10
76	Rec 1 Index	R/W	UINT8	1	0–49	0.0	Well index for Recalculable Test 1
77	Rec 2 Index	R/W	UINT8	1	0–49	0.0	Well index for Recalculable Test 2
78	Rec 3 Index	R/W	UINT8	1	0–49	0.0	Well index for Recalculable Test 3
79	Rec 4 Index	R/W	UINT8	1	0–49	0.0	Well index for Recalculable Test 4
80	Rec 5 Index	R/W	UINT8	1	0–49	0.0	Well index for Recalculable Test 5
81	Rec 6 Index	R/W	UINT8	1	0–49	0.0	Well index for Recalculable Test 6
82	Rec 7 Index	R/W	UINT8	1	0–49	0.0	Well index for Recalculable Test 7
83	Rec 8 Index	R/W	UINT8	1	0–49	0.0	Well index for Recalculable Test 8
84	Rec 9 Index	R/W	UINT8	1	0–49	0.0	Well index for Recalculable Test 9
85	Rec 10 Index	R/W	UINT8	1	0–49	0.0	Well index for Recalculable Test 10

A.6 MMI Interface parameters (UDP 71)

Table A-5 **MMI Interface parameters (UDP 71)**

#	Name	Access	Data type	Length	Range	Default value	Description
0	Point Tag ID	R/W	ASCII	10	0x20–0x7E for each ASCII character	“NOC Stn”	Name
1	Density Press Comp Option	R/W	UINT8	1	0–1	0	ROC809-based pressure compensation for density: • 0 = Disabled • 1 = Enabled
2	Mass Press Comp Option	R/W	UINT8	1	0–1	0	ROC809-based pressure compensation for mass: • 0 = Disabled • 1 = Enabled

Table A-5 MMI Interface parameters (UDP 71) *continued*

#	Name	Access	Data type	Length	Range	Default value	Description
3	Density Press Comp Coeff	R/W	FLOAT	4	IEEE 754 float	0.0	Density factor (change in fluid density, in g/cm^3/psi) stored in ROC809
4	Mass Press Comp Coeff	R/W	FLOAT	4	IEEE 754 float	0.0	Flow factor (% change in flow rate per psi) stored in ROC809
5	COM Port TLP	R/W	TLP	3	Any valid TLP	0,0,0	Comm port on ROC809 platform used for communication with Micro Motion sensor
6	Device Modbus Address	R/W	UINT8	1	0–255	0	Modbus address of Micro Motion sensor
7	Scanning Mode	R/W	UINT8	1	0–1	0	Retrieve data from the Micro Motion sensor: • 0 = Disabled • 1 = Enabled
8	Communi-cation Status	R/O	UINT8	1	0–1	0	• 0 = Communicating with the core processor • 1 = Not communicating with the core processor
9	Alarms 1 Reg 245	R/W	FLOAT	4	IEEE 754 float	0.0	Data from Micro Motion sensor; doubleword converted to float
10	Mass Flowrate Reg 247	R/W	FLOAT	4	IEEE 754 float	0.0	Current mass flow rate, in core processor mass flow units
11	Density Reg 249	R/W	FLOAT	4	IEEE 754 float	0.0	Current density, in core processor density units
12	Temperature Reg 251	R/W	FLOAT	4	IEEE 754 float	0.0	Current temperature, in core temperature processor units
13	Vol Flowrate Reg 253	R/W	FLOAT	4	IEEE 754 float	0.0	Current volume flow rate, in core processor liquid volume flow units
14	Viscosity Unused Reg 255	R/W	FLOAT	4	IEEE 754 float	0.0	Not used
15	Internal Derived Pressure Reg 257	R/W	FLOAT	4	IEEE 754 float	0.0	Not used
16	Mass Total Reg 259	R/W	FLOAT	4	IEEE 754 float	0.0	Current value of mass totalizer, in core processor mass units
17	Vol Total Reg 261	R/W	FLOAT	4	IEEE 754 float	0.0	Current value of volume totalizer, in core processor liquid volume units
18	Mass Inventory Reg 263	R/W	FLOAT	4	IEEE 754 float	0.0	Current value of mass inventory, in core processor mass units
19	Vol Inventory Reg 265	R/W	FLOAT	4	IEEE 754 float	0.0	Current value of volume inventory, in core processor liquid volume units
20	Press Corr Factor Flow Reg 267	R/W	FLOAT	4	IEEE 754 float	0.0	Flow factor (% change in flow rate per psi) stored in core processor

Table A-5 **MMI Interface parameters (UDP 71)** *continued*

#	Name	Access	Data type	Length	Range	Default value	Description
21	Press Corr Factor Dens Reg 269	R/W	FLOAT	4	IEEE 754 float	0.0	Density factor (change in fluid density, in g/cm^3/psi) stored in core processor
22	Flow Calibration Press Reg 271	R/W	FLOAT	4	IEEE 754 float	0.0	Pressure at which sensor was calibrated
23	Press Input at 4 mA Reg 273	R/W	FLOAT	4	IEEE 754 float	0.0	Not used
24	Press Input at 20 mA Reg 275	R/W	FLOAT	4	IEEE 754 float	0.0	Not used
25	Density Value for FD Calibration Reg 277	R/W	FLOAT	4	IEEE 754 float	0.0	Density value for flowing density calibration
26	Mass Rate Factor Reg 279	R/W	FLOAT	4	IEEE 754 float	0.0	Mass flow rate meter factor
27	Volume Rate Factor Reg 281	R/W	FLOAT	4	IEEE 754 float	0.0	Volume flow rate meter factor
28	Density Factor Reg 283	R/W	FLOAT	4	IEEE 754 float	0.0	Density meter factor
29	Raw Tube Frequency Hz Reg 285	R/W	FLOAT	4	IEEE 754 float	0.0	Sensor tube frequency, in Hz
30	Left Pickoff Volts Reg 287	R/W	FLOAT	4	IEEE 754 float	0.0	Sensor LPO voltage, in volts
31	Right Pickoff Volts Reg 289	R/W	FLOAT	4	IEEE 754 float	0.0	Sensor RPO voltage, in volts
32	Coriolis Drive Gain Reg 291	R/W	FLOAT	4	IEEE 754 float	0.0	Sensor drive gain, in %
33	Coriolis Alarm1 Short1	R/O	UINT16	2	0–65565	0	Core processor register 245
34	Coriolis Alarm1 Short2	R/O	UINT16	2	0–65565	0	Core processor register 246
35	Num Good messages	R/W	UINT32	4	0–U32	0	Number of good responses received from the core processor since previous reset
36	Num Bad messages	R/W	UINT32	4	0–U32	0	Number of bad responses received from the core processor since previous reset
37	Poll Speed	R/O	FLOAT	4	IEEE 754 float	0.0	Duration of the previous poll cycle, in seconds

Table A-5 MMI Interface parameters (UDP 71) *continued*

#	Name	Access	Data type	Length	Range	Default value	Description
38	Press Corrected Mass	R/O	FLOAT	4	IEEE 754 float	0.0	Current mass flow rate, with ROC809-based pressure compensation applied
39	Press Corrected Density	R/O	FLOAT	4	IEEE 754 float	0.0	Current density, with ROC809-based pressure compensation applied
40	Mass Flowrate Conv Units	R/O	FLOAT	4	IEEE 754 float	0.0	Parameter 10 converted to ROC809 units
41	Density Conv Units	R/O	FLOAT	4	IEEE 754 float	0.0	Parameter 11 converted to ROC809 units
42	Temperature Conv Units	R/O	FLOAT	4	IEEE 754 float	0.0	Parameter 12 converted to ROC809 units
43	Vol Flowrate Conv Units	R/O	FLOAT	4	IEEE 754 float	0.0	Parameter 13 converted to ROC809 units
44	Mass Total Conv Units	R/O	FLOAT	4	IEEE 754 float	0.0	Parameter 16 converted to ROC809 units
45	Volume Total Conv Units	R/O	FLOAT	4	IEEE 754 float	0.0	Parameter 17 converted to ROC809 units
46	Mass Inventory Conv Units	R/O	FLOAT	4	IEEE 754 float	0.0	Parameter 18 converted to ROC809 units
47	Volume Inventory Conv Units	R/O	FLOAT	4	IEEE 754 float	0.0	Parameter 19 converted to ROC809 units
48	Read Command	R/W	UINT8	1	0–2	0	Not used
49	Write Command	R/W	UINT8	1	0–2	0	Not used
50	Slave Register Data Type	R/W	UINT8	1	0–4	0	Not used
51	Slave Register Number	R/W	UINT16	1	0–65536	0	Not used
52	Command Status	R/O	UINT8	1	0–128	0	Not used
53	Master Register 1	R/W	FLOAT	4	IEEE 754 float	0.0	Not used
54	Master Register 2	R/W	FLOAT	4	IEEE 754 float	0.0	Not used
55	Master Register 3	R/W	FLOAT	4	IEEE 754 float	0.0	Not used
56	Master Register 4	R/W	FLOAT	4	IEEE 754 float	0.0	Not used

Index

A

AGA license 67
Alarms
  alarm log 16
  status 98
  viewing
    flow alarms 80
    status alarms 80
Alarms panel
  MMI Interface 35
  NOC Meter 46
  NOC Station 32
Applied
  See Water cut, applied
Averages panel
  NOC Meter 45
  NOC Recalc 57
  NOC Station 29

B

Barrier
  See I.S. barrier
Base pressure
  See Pressure, reference
Base temperature
  See Temperature, reference

C

Calibration
  troubleshooting 102
Characterizing
  troubleshooting 102
Comm Setup panel 33
Communication tools 2
Compensation 6
Components 1
Configuration
  Contract Hour 62
  gas measurement 67
  general procedure 61
  measurement units 62
  MMI Interface 63
  NOC Meter 64
  NOC Station 62
  NOC system and Net Oil Computer Software 61
  overview 3
  planning 5
  planning worksheet 17
  preparing the ROC809 19
  pressure compensation 64
  transient bubble remediation 65
  verifying Net Oil Computer Software 20
  verifying startup configuration file 20
  water cut measurement using water cut probes 69
  Well Data 63
Configuration panel 50
Continuous mode 75
  changing configuration during 77
  contract hour 77
  contract period 15
  data stored on ROC809 15
  Force End of Day 77
  maximum data storage 15
  recalculating data 82
  See Net Oil Computer Software, Continuous mode
  using 76
  viewing NOC data
    contract period data 78
    current data 78
Contract Hour 25
  configuring 62
Contract period 25
  configuring Contract Hour 62
  recalculating data 82
Core processor 1
  troubleshooting 105
Core processor LED
  troubleshooting 106
Correction 6
Customer service 4

D

Dead oil 6
Density
  oil density at reference 7
  water density at reference 7
Density Determination panel 48

Density determination routines 71
determining oil density 72
determining water density 72
preparing for 71
Density-based water cut
See Water cut, density-based
Device address 9, 33, 38
Displays
MMI Interface 7
NOC Meter 7
NOC Recalc 7
NOC Station 7
Well Data 7
Documentation resources 2
Drive gain
troubleshooting 104
Dry oil 6

E

Emulsion
See Liquid
Event log 16

F

Force End of Day 25, 77
Free water
definition 6
Free Water Setpoint 10
measurement 10
Free Water Setpoint 38, 64

G

Gas leg 6
Gas measurement
AGA license 67
configuring 67
gas meter 68
gas station 67
NOC Gas Station 68
viewing gas data 81
Gas meter 7, 68
Gas Oil Ratio 53
Gas station
NOC Gas Station 68
ROC809 gas station 25, 67
General panel
NOC Meter 37
NOC Recalc 54
NOC Station 23
Glossary
See Terminology
GOR
See Gas Oil Ratio
Grounding
troubleshooting 103

H

History 85
History panel 51

I

I.S. barrier 1
Inputs panel 38
Instant Values panel 41
Interface 6

L

LED
See Status LED, core processor LED
Level sensor 1
Liquid 6
Liquid leg 6
Live oil 6
Lookback Period 14, 40
Low pickoff voltage 105

M

Manuals 2
Measurement units
changing 77, 80
configuring 62
Micro Motion customer service 4
Mixture water 6
MMI Interface 7
Alarms panel 35
Comm Setup panel 33
parameter definitions 33
configuration 63
panels 32
predefined Modbus register ranges 94
Pressure Compensation panel 36
parameter definitions 36
Registers panel 34
parameter definitions 34
Modbus
device address 9, 33, 38
Net Oil Computer Software interface 86

predefined register ranges 86
MMI Interface data 94
NOC Meter data 88
NOC Station data 87
Recalculation data 91, 93
well configuration data 95
well test data 96
MVD Direct Connect I.S. barrier
See I.S. barrier

N

Net oil 6
Net Oil Computer Software 1
configuring 61
Continuous mode 11
displays 7
history 85
Modbus interface 86
sensor input 7
user-defined points 111
using 75
Continuous mode 76
Well Test mode 79
verifying startup configuration file 20
verifying user program 20
viewing
Continuous mode data 78
gas data 81
well test data 80
Well Test mode 11
NOC
See Net Oil Computer Software, NOC system
NOC data
recalculation 16
stored on ROC809 15
viewing 15
Continuous mode 78
Well Test mode 80
NOC Meter 7
Alarms panel 46
parameter definitions 47
Averages panel 45
parameter definitions 46
configuration 64
Density Determination panel 48
parameter definitions 49
General panel 37
parameter definitions 37
Inputs panel 38
parameter definitions 39
Instant Values panel 41
parameter definitions 42
mapping to MMI sensor 9
panels 37
predefined Modbus register ranges 88
TBR panel 40
parameter definitions 40
Totals panel 43
parameter definitions 44
NOC Recalc
Averages panel 57
parameter definitions 57
General panel 54
parameter definitions 54
panels 54
Recalculable Tests panel 58
parameter definitions 59
Totals panel 55
parameter definitions 56
NOC Recalc display 7
NOC Station 7
Alarms panel 32
Averages panel 29
parameter definitions 30
configuring 62
General panel 23
parameter definitions 25
panels 23
predefined Modbus register ranges 87
Totals panel 27
parameter definitions 28
Units panel 26
parameter definitions 26
NOC system 1
Communication tools 2
components 1
configuration planning 5
configuration planning worksheet 17
configuring 61
definition 5
documentation 2
maintenance 97
options 5
overview 5
terminology 5
troubleshooting 97
using 75
Continuous mode 76
Well Test mode 79

viewing
Continuous mode data 78
gas data 81
well test data 80
NOCStartup_CONTINUOUS.800 20
NOCStartup_WELLTEST.800 20

O

Oil
dead 6
density at reference 7
dry 6
live 6
net 6
wet 6
Oil leg 6, 10
measuring production fluid 10
Oil/water leg
See Liquid leg
Oil/water mixture
See Liquid
Operation modes 11, 75
changing 11, 75
Orifice plate meter 1

P

Panels
MMI Interface 32
Alarms panel 35
Comm Setup panel 33
Pressure Compensation panel 36
Registers panel 34
NOC Meter 37
Alarms panel 46
Averages panel 45
Density Determination panel 48
General panel 37
Inputs panel 38
Instant Values panel 41
TBR panel 40
Totals panel 43
NOC Recalc 54
Averages panel 57
General panel 54
Recalculable Tests panel 58
Totals panel 55
NOC Station 23
Alarms panel 32
Averages panel 29
General panel 23
Totals panel 27
Units panel 26
Well Selection panel 31
Well Data 50
Configuration panel 50
History panel 51
Pickoff voltage 105
Power supply
troubleshooting 103
Pressure
compensation 13
configuring 64
correction 12
process 6
reference 6
Pressure Compensation panel 36
Pressure sensor 1
Process pressure 6
Process temperature 6
Process variable
troubleshooting 99
Produced water
See Total water
Production fluid 6
ProLink II 2

R

Rag layer 6
Recalculable Tests panel 58
Recalculation feature 16
predefined Modbus register ranges 91, 93
using
contract period data 82
well test data 81
Reference pressure
See Pressure, reference
Reference temperature
See Temperature, reference
Registers panel 34
Remote Automation Solutions 1

ROC809 1
alarm log 16
configuration 19
definition 5
event log 16
gas meter 68
gas station 67
user program 7
ROC809 gas station 25
ROCLINK 800 2
connection problems 97

S

See Water cut, density-based
Sensor 1
gas measurement 7
input to Net Oil Computer Software 7, 9
Modbus device address 9, 33, 38
oil leg vs. water leg 10
Separator
three-phase 6
two-phase 6
Slug flow
troubleshooting 102
Startup configuration files 20
Status alarms 98

T

TBR
See Transient bubble remediation
TBR panel 40
Temperature
correction 12
process 6
reference 6
changing 77, 80, 81
Temperature sensor 1
Terminology 5
Test points
troubleshooting 104
Time base
changing 77, 80, 81
TLP
See User-defined points
Total water 6
Totals panel
NOC Meter 43
NOC Recalc 55
NOC Station 27
Transient bubble remediation 13
configuring 65
Correct Density option 14
Lookback Period 14
Transition 6
Troubleshooting
calibration 102
characterization 102
core processor 105
core processor LED 106
core processor resistance test 106
drive gain 104
grounding 103
low pickoff voltage 105
power supply wiring 103
process variables 99
ROCLINK 800 connection problems 97
sensor resistance 107
sensor-to-ROC809 wiring 103
short to case 107
slug flow 102
status alarms 98
test points 104
wiring problems 103
Turbine meter 1

U

UDP
See User-defined points
Uncorrected 6
Units panel 26
User program 7
User-defined points 111

W

Water
density at reference 7
free 6
mixture 6
total 6
Water cut 12
applied 7
definition 7
density-based 7, 12
determination options 12
from water cut probe 12
Water cut probe 1
configuring 69
definition 7

Water leg 6, 10
measuring production fluid 10
WCP
See Water cut probe
Well configuration data
changing 77, 80
predefined Modbus register ranges 95
Well Data 7
Configuration panel 50
parameter definitions 50
configuring 63
History panel 51
parameter definitions 52
panels 50
Well test
changing configuration during 80
performing 79
predefined Modbus register ranges 96
recalculating data 81
stored on ROC809 15
viewing current data 80
viewing stored data 80
Well Test mode 75
maximum data storage 15
See Net Oil Computer Software, Well Test mode
See Well test
Wells
configuring 63
data required for configuration 11
density determination 71
Wet oil 6
Wiring problems 103

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Micro Motion Inc. USA
Worldwide Headquarters
7070 Winchester Circle
Boulder, Colorado 80301
T +1 303-527-5200
+1 800-522-6277
F +1 303-530-8459

Micro Motion Europe
Emerson Process Management
Neonstraat 1
6718 WX Ede
The Netherlands
T +31 (0) 318 495 555
F +31 (0) 318 495 556

Micro Motion Asia
Emerson Process Management
1 Pandan Crescent
Singapore 128461
Republic of Singapore
T +65 6777-8211
F +65 6770-8003

Micro Motion United Kingdom
Emerson Process Management Limited
Horsfield Way
Bredbury Industrial Estate
Stockport SK6 2SU U.K.
T +44 0870 240 1978
F +44 0800 966 181

Micro Motion Japan
Emerson Process Management
1-2-5, Higashi Shinagawa
Shinagawa-ku
Tokyo 140-0002 Japan
T +81 3 5769-6803
F +81 3 5769-6844

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